(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 226 786 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
13.04.2016 Bulletin 2016/15

(21) Application number: **09818966.5**

(22) Date of filing: **06.10.2009**

(51) Int Cl.:
G09G 3/32 *(2006.01)*

(86) International application number:
PCT/JP2009/005181

(87) International publication number:
WO 2010/041426 (15.04.2010 Gazette 2010/15)

(54) **IMAGE DISPLAY DEVICE AND METHOD OF CONTROLLING THE SAME**

BILDANZEIGEVORRICHTUNG UND STEUERUNGSVERFAHREN DAFÜR

DISPOSITIF AFFICHEUR D'IMAGE, ET PROCÉDÉ DE COMMANDE CORRESPONDANT

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR

(30) Priority: **07.10.2008 JP 2008261029**

(43) Date of publication of application:
08.09.2010 Bulletin 2010/36

(60) Divisional application:
13160008.2 / 2 613 305

(73) Proprietor: **JOLED INC.**
Tokyo 101-0054 (JP)

(72) Inventor: **ONO, Shinya**
Chuo-ku,
Osaka 540-6207 (JP)

(74) Representative: **Grünecker Patent- und Rechtsanwälte**
PartG mbB
Leopoldstraße 4
80802 München (DE)

(56) References cited:
JP-A- 2003 186 438
JP-A- 2005 346 073
JP-A- 2006 072 303
JP-A- 2008 203 655
US-A1- 2003 111 966
US-A1- 2005 243 076
US-A1- 2006 066 251
US-A1- 2006 231 740
US-A1- 2006 238 461

EP 2 226 786 B1

Description

[0001] The present invention relates to image display devices and methods of controlling the same, and in particular to an image display device using a current-driven luminescence element and a method of controlling the same.

[0002] Image display devices in which organic electro-luminescence (EL) elements are used are known as image display devices with which current-driven luminescence elements are used. The organic EL display devices using organic EL elements which emit light are best suited to make thinner devices because such organic EL elements eliminate the necessity of back lights conventionally required for liquid crystal display devices. In addition, the organic EL elements do not place a limit on view angle, and thus are expected to be practically used as next-generation display devices. Further, the organic EL elements used for the organic EL display devices including luminance elements whose luminance are controlled by currents having certain values, instead of including liquid crystal cells controlled by voltages to be applied thereto.

[0003] In a usual organic EL display device, organic EL elements which serve as pixels are arranged in a matrix. An organic EL display is called a passive-matrix organic EL display, in which organic electro-luminescence elements are provided at intersections of row electrodes (scanning lines) and column electrodes (data lines) and voltages corresponding to data signals are applied to between selected row electrodes and the column electrodes to drive the organic EL elements.

[0004] On the other hand, an organic EL display device is called an active-matrix organic EL display, in which switching thin film transistors (TFTs) are provided at the intersections of scanning lines and data lines and connected with the gates of driving transistors which receive data signals, through the signal lines, when the TFTs are turned on through selected scanning lines, and causes the driving transistors to activate the organic EL elements.

[0005] Although the passive-matrix organic EL display device in which organic EL elements connected to selected row electrodes (scanning lines) emit light only until the selected row electrodes become unselected, organic EL elements in the active-matrix organic EL display device keep emitting light until they are scanned (or selected). Thus, there is no reduction in luminance even when the number of scanning lines increases. Accordingly, the active-matrix organic EL display device is driven with a low voltage, thereby consuming less power.

[0006] Patent Reference 1 discloses a circuit configuration of pixel units in an active-matrix organic EL display device.

[0007] FIG. 16 is a diagram showing a circuit configuration of a pixel unit in a conventional organic EL display device disclosed in Patent Reference 1. The pixel unit 500 is configured with a simple circuitry including: an organic EL element 505 having a cathode connected to a negative power source line (whose voltage value is denoted as VEE); an n-type thin film transistor (n-type TFT) 504 having a drain connected to a positive power source line (whose voltage value is denoted as VDD) and a source connected to the anode of the organic EL element 505; a capacitor element 503 which is connected to between the gate and source of the n-type TFT 504 and holds a gate voltage of the n-type TFT 504; a third switching element 509 for causing both the terminals of the organic EL element 505 to have approximately the same potential; a first switching element 501 which selectively applies a video signal from a signal line 506 to the gate of the n-type TFT 504; and a second switching element 502 for initializing the gate potential of the n-type TFT 504 into a predetermined potential. The following describes light emitting operations performed by the pixel unit 500.

[0008] First, the second switching element 502 is brought into an on state by a scanning signal supplied from the second scanning line 508. A predetermined voltage VREF supplied from a reference power source line is applied to the gate of the n-type TFT 504 so as to prevent a current from flowing into between the source and drain of the n-type TFT 504 in order to initialize the n-type TFT 504.

[0009] Next, the second switching element 502 is brought into an off state by a scanning signal supplied from the second scanning line 508 (S102).

[0010] Next, the first switching element 501 is brought into an on state by a scanning signal supplied from the first scanning line 507 to apply a signal voltage supplied from the signal line 506 to the gate of the n-type TFT 504 (S103). At this time, the gate of the third switching element 509 is connected to the first scanning line 507, and thus becomes conductive simultaneously with the first switching element 501. This makes it possible to accumulate charge corresponding to a signal voltage in the capacitor element 503 without being affected by the voltage between the terminals of the organic EL element 505. In addition, the organic EL element 505 is not supplied with a current while the third switching element 509 is conductive, and thus does not emit light.

[0011] Next, the third switching element 509 is brought into an off state by a scanning signal supplied from the first scanning line 507 to supply a signal current corresponding to the charge accumulated in the capacitor element 503 from the n-type TFT 504 to the organic EL element 505 (S104). At this time, the organic EL element 505 emits light.

[0012] The sequential operations described above enable the organic EL element 505 to emit light with a luminance corresponding to the signal voltage supplied from the signal line in a frame period.

[0013] Patent reference 1: Japanese Unexamined Patent Application Publication No. 2005-4173

[0014] Reference US 2003111966 discloses an image display device, wherein as each of sampling switch elements turns on in response to a scanning signal, a signal voltage from a signal wire is held on and written into a sampling capacitor. At this time, the signal voltage is held on the sampling capacitor on the basis of a common electrode. As the scanning signal transitions from high level to low level, each of the sampling switch elements turns off and changes into a floating state in which the sampling capacitor is electrically insulated from the signal wire and a driving TFT. As the scanning signal changes from high level to low level, each of the driving switches becomes conductive so that the signal voltage held on the sampling capacitor is applied as it is between the source and gate of the driving TFT as a bias voltage to make the driving TFT conductive, causing an organic LED to emit light.

[0015] Reference US 2006/066251 discloses an organic light emitting display for minimizing or preventing nonuniformity in image quality, which includes a first transistor having a gate electrode connected to a first selection signal, a source electrode connected to a data signal, and a drain electrode connected to a second node; a second transistor having a gate electrode connected to the first selection signal, a source electrode connected to a power voltage, and a drain electrode connected to a first node; a third transistor having a gate electrode connected to a second selection signal, a source electrode connected to a reference voltage, and a drain electrode connected to the second node; a capacitor connected between the first node and the second node; and a fourth transistor having a gate electrode connected to the first node, a source electrode connected to the power voltage, and a drain electrode connected to an organic light emitting diode.

[0016] Reference US 2005-243076 discloses an organic light-emitting device, which includes a first transistor for applying a data voltage; a second transistor for applying a driving current depending on the data voltage and an initiation voltage to an organic light-emitting diode; a third transistor for generating a threshold voltage; a fourth transistor for applying an initiation voltage, the fourth transistor being connected to the third transistor; a fifth transistor for applying a power voltage; and a condenser provided between a first node connected to the third and fifth transistors and a second node connected to the first and second transistors, for maintaining the power voltage and the threshold voltage for compensation.

[0017] Reference US 2006-231740 discloses a method of driving an electronic circuit. The electronic circuit includes a light-emitting element that is interposed between a first electric supply line and a second electric supply line having different potentials and emits light by the supply of a current, a storage capacitor that holds a voltage between a first electrode and a second electrode, and a driving transistor that is interposed between the first electric supply line and the second electric supply line and has a gate terminal connected to the first electrode of the storage capacitor. The method includes: for a first period, applying a data potential according to a gray-scale level designated for the light-emitting element to the second electrode of the storage capacitor while electrically connecting an initialization wiring line supplied with an initialization potential to the first electrode of the storage capacitor; and for a second period subsequent to the first period, electrically connecting the second electrode of the storage capacitor to a source terminal of the driving transistor.

[0018] However, the conventional organic EL display device disclosed in Patent Reference 1 allows a current to flow into the negative power source line through the third switching element 509 because the n-type TFT 504 is brought into an on state when the signal voltage is stored on the gate of the n-type TFT 504 (Step S103). This current flows into the resistance components of the third switching element 509 and the negative power source line, resulting in variation in the potential of the source of the n-type TFT 504. In other words, the voltage which should be held by the capacitor element 503 inevitably varies.

[0019] As described above, in the case of configuring a pixel circuitry which performs a source grounding operation in form of the n-type TFT such as an amorphous Si, it is difficult to store an exact potential between both the end electrodes of the capacitor element having a function of holding a voltage between the gate and source of the n-type driving TFT. In this case, since no exact signal current corresponding to the signal voltage flows, the luminescence elements do not emit light properly. This disables achievement of highly accurate image display reflecting the video signal.

[0020] In view of the above described problems, the present invention has an object to provide, in form of a simple pixel circuitry, an image display device which includes luminescence pixels and is capable of storing an exact potential corresponding to a signal voltage to both the end electrodes of the electrostatic capacitor which holds a voltage between the gate and source of the n-type driving TFT.

[0021] This is achieved by the features of the independent claims. Preferred embodiments are subject matter of the dependent claims.

[0022] According to an image display device and a method of controlling the same in the present invention, only currents flowing through luminescence elements flow into an n-type driving TFT without passing through reference power source lines and signal lines. This makes it possible to store an exact potential on both the end electrodes of the capacitor element having a function of holding the voltage between the gate and source of the n-type driving TFT, thereby achieving a highly accurate image display reflecting a video signal.

[0023]

[Fig. 1]
FIG. 1 is a block diagram showing an electrical configuration of an image display device according to an embodiment of the present invention.

[Fig. 2]
FIG. 2 is a diagram showing a circuit configuration of a luminescence pixel included in a display unit and connections with the surrounding circuits according to illustrative embodiment 1. invention.
[Fig. 3A]
FIG. 3A is a chart showing operation timings in a method of controlling image display devices according to illustrative embodiments 1 and 2.
[Fig. 3B]
FIG. 3B is a chart showing operation timings in a Variation of a method of controlling the image display devices according to illustrative embodiments 1 and 2.
[Fig. 4]
FIG. 4 is a flowchart indicating operations performed by the image display device according to illustrative embodiment 1.
[Fig. 5A]
FIG. 5A is a diagram showing a pixel circuit in a conductive state while a signal voltage is being written by the image display device according to illustrative embodiment 1.
[Fig. 5B]
FIG. 5B is a diagram showing a pixel circuit in a conductive state while the image display device according to illustrative embodiment 1 emitting light.
[Fig. 6]
FIG. 6 is a diagram showing a circuit configuration of a luminescence pixel included in a display unit and connections with the surrounding circuits according to illustrative embodiment 2.
[Fig. 7]
FIG. 7 is a flowchart of operations performed by the image display device according to illustrative embodiment 2.
[Fig. 8]
FIG. 8 is a diagram showing a circuit configuration of a luminescence pixel included in a display unit and connections with the surrounding circuits according to Embodiment 3 of the present invention.
[Fig. 9]
FIG. 9 is a chart showing operation timings in a method of controlling an image display device according to Embodiment 3 of the present invention.
[Fig. 10]
FIG. 10 is a flowchart of operations performed by the image display device according to Embodiment 3 of the present invention.
[Fig. 11]
FIG. 11 is a diagram showing a circuit configuration indicating a Variation of luminescence pixels included in a display unit and connections with the surrounding circuits according to Embodiment 3 of the present invention.
[Fig. 12]
FIG. 12 is a chart showing operation timings in a Variation of the method of controlling luminescence pixels in the image display device according to Embodiment 3 of the present invention.
[Fig. 13]
FIG. 13 is an operation flowchart indicating a Variation of luminescence pixels in the image display device according to Embodiment 3 of the present invention.
[Fig. 14]
FIG. 14 is a diagram showing a circuit configuration of a luminescence pixel and connections with the surrounding circuits which are obtained by combining Embodiments 2 and 3 of the present invention.
[Fig. 15]
FIG. 15 is an external view of a thin flat TV including an embedded image display device according to an embodiment of the present invention.
[Fig. 16]
FIG. 16 is a diagram showing a circuit configuration of a pixel unit in the conventional organic EL display device disclosed in Patent Reference 1.

[0024] Preferred embodiments of the present invention will be described below with reference to the drawings. In the following descriptions, the same or equivalent elements are assigned with the same reference numerals throughout the drawings, and the same descriptions are not repeated.

[First illustrative embodiment]

[0025] The first embodiment described herebelow does not form part of the invention but represents background art that is usefull for understanding the invention.

[0026] An image display device in this embodiment includes luminescence pixels arranged in a matrix. Each of the luminescence pixels includes: a luminescence element; a capacitor; a driving element having a gate connected to a first electrode of the capacitor and having a source connected to the luminescence element; a third switching element for switching between conductive and non-conductive states between the source of the driving element and the second electrode of the capacitor; a first switching element for switching between conductive and non-conductive states between a reference power source line and a first electrode of the capacitor; and a second switching element for switching between conductive and non-conductive states between a data line and a second electrode of the capacitor. This configuration enables storage of an accurate potential corresponding to a signal voltage onto both end terminals of the capacitor. This makes it possible to achieve an accurate image display reflecting a video signal.

[0027] The first illustrative embodiment will be described below with reference to the drawings.

[0028] FIG. 1 is a block diagram showing an electrical configuration of an image display device according to the first illustrative embodiment. The image display device 1 in the diagram includes a control circuit 2, a memory 3, a scanning line driving circuit 4, a signal line driving circuit 5, and a display unit 6.

[0029] In addition, FIG. 2 is a diagram showing a circuit configuration of a luminescence pixel included in a display unit and connections with the surrounding circuits according to the first illustrative embodiment. The luminescence pixel 10 includes switching transistors 11, 12, and 19, an electrostatic capacitor 13, a driving transistor 14, an organic EL element 15, a signal line 16, scanning lines 17 and 18, a reference power source line 20, a positive power source line 21, and a negative power source line 22. In addition, the surrounding circuits include a scanning line driving circuit 4 and a signal line driving circuit 5.

[0030] The following descriptions are given of connection relationships and functions of the structural elements shown in FIGS. 1 and 2.

[0031] The control circuit 2 has a function of controlling the scanning line driving circuit 4, the signal line driving circuit 5, and the memory 3. The memory 3 stores correction data or the like of the respective luminescence pixels. Based on the correction data written in the memory 3 and read out therefrom, a video signal inputted from outside is corrected and then outputted to the signal line driving circuit 5.

[0032] The scanning line driving circuit 4 is connected to the scanning lines 17 and 18, and functions as a driving circuit for controlling between conductive and non-conductive states of the switching transistors 11, 12, and 19 included in the luminescence pixel 10 by outputting a scanning signal to the scanning lines 17 and 18.

[0033] The signal line driving circuit 5 is connected to the signal line 16, and functions as a driving circuit for outputting a signal voltage based on a video signal to the luminescence pixel 10.

[0034] The display unit 6 includes luminescence pixels 10, and displays an image, based on the video signal inputted from outside to the image display device 1.

[0035] The switching transistor 11, as the second switching element, has a gate connected to the scanning line 17 that is the second scanning line, and has a source and drain one of which is connected to the signal line 16 that is the data line and the other of which is connected to an electrode 132 that is the second electrode of the electrostatic capacitor 13. The switching transistor 11 has a function of determining a timing with which the signal voltage of the signal line 16 is applied to the electrode 132 of the electrostatic capacitor 13.

[0036] The switching transistor 12, as the first switching element, has a gate connected to the scanning line 17 that is the first scanning line, and has a source and drain one of which is connected to the reference power source line 20 that is the first reference power source line and the other of which is connected to an electrode 131 that is the first electrode of the electrostatic capacitor 13. The switching transistor 12 has a function of determining a timing with which the reference voltage VREF of the reference power source line 20 is applied to the electrode 131 of the electrostatic capacitor 13. The switching transistors 11 and 12 are configured in form of n-type thin film transistors (n-type TFTs).

[0037] It is to be noted that the first scanning line and the second scanning line are provided as a common scanning line 17, thereby reducing the number of scanning lines for controlling the switching transistors and simplifying the circuit configuration.

[0038] The electrostatic capacitor 13 is a capacitor having the electrode 131 that is the first electrode connected to the gate of the driving transistor 14, and having the electrode 132 that is the second electrode connected to the source of the driving transistor 14 through the switching transistor 19. The electrostatic capacitor 13 holds the voltage corresponding to the signal voltage supplied from the signal line 16. In the case where the switching transistors 11 and 12 are brought into an off state, the electrostatic capacitor 13 exerts the function of causing the driving transistor 14 to hold a constant potential between its gate and source electrodes, and thereby stabilizing a current to be supplied from the driving transistor 14 to the organic EL element 15.

[0039] The driving transistor 14 is a driving element having a drain connected to a positive power source line 21 that is the second power source line, and having a source connected to the anode of the organic EL element 15. The driving transistor 14 converts the voltage corresponding to the signal voltage applied between the gate and source into a drain current corresponding to the signal voltage. Subsequently, the driving transistor 14 supplies this drain current as the signal current to the organic EL element 15. The driving transistor 14 is configured in form of n-type thin film transistor (n-type TFT), for example.

[0040] The organic EL element 15 is a luminescence element having a cathode connected to the negative power source line 22 that is the second power source line, and emits light triggered by the signal current flowing from the driving transistor 14.

[0041] The switching transistor 19, as the third switching element, has a gate connected to the scanning line 18 that is the third scanning line, and has a source and drain one of which is connected to the source of the driving transistor 14 and the other of which is connected to an electrode 132 of the electrostatic capacitor 13. The switching transistor 19 has a function of determining a timing with which the potential held by the electrostatic capacitor 13 is applied to between the gate and source of the driving transistor 14. The switching transistor 19 is configured in form of n-type thin film transistor (n-type TFT).

[0042] The signal line 16 is connected to a signal line driving circuit 5 and to each of luminescence pixels belonging to a pixel column including the luminescence pixel 10, and has a function of supplying a signal voltage that determines the luminance intensity of the pixels.

[0043] In addition, the image display device 1 includes signal lines 16 in number corresponding to the number of pixel columns.

[0044] The scanning line 17 concurrently serves as the first scanning line and the second scanning line, is connected to the scanning line driving circuit 4, and is also connected to each of the luminescence pixels belonging to the pixel line including the luminescence pixel 10. With this, the scanning line 17 has a function of supplying a timing with which the signal voltage is written into each of the luminescence pixels belonging to the pixel line including the luminescence pixel 10, and a function of supplying a timing with which the reference voltage VREF is applied to the gate of the driving transistor 14 included in the luminescence pixel.

[0045] The scanning line 18 is the third scanning line, and is connected to the scanning line driving circuit 4. With this, the scanning line 18 has a function of supplying a timing with which the potential of the electrode 132 of the electrostatic capacitor 13 is applied to the source of the driving transistor 14.

[0046] In addition, the image display device 1 includes scanning lines 17 and 18 in number corresponding to the number of pixel lines.

[0047] It is to be noted that each of the reference power source line 20, the positive power source line 21 that is the first power source line, and the negative power source line 22 that is the second power source line is connected to other luminescence pixels and the voltage source.

[0048] Next, a description is given of a method of controlling the image display device 1 according to this embodiment with reference to FIGS. 3A to 5B.

[0049] FIG. 3A is a chart showing operation timings in a method of controlling the image display device according to the first illustrative embodiment. In the diagram, the horizontal axis represents time, and in the vertical direction, waveforms of voltages generated in the scanning line 17, the scanning line 18, and the signal line 16 are shown from top to bottom in this sequence. In addition, FIG. 4 is a flowchart of operations performed by the image display device according to Embodiment 1 of the present invention.

[0050] First, at Time t0, the scanning line driving circuit 4 changes the voltage level of the scanning line 18 from HIGH to LOW to bring the switching transistor 19 into an off state. With this, the source of the driving transistor 14 and the electrode 132 of the electrostatic capacitor 13 become non-conductive (Step S11 in FIG. 4). For example, in this embodiment, the voltage levels of the scanning line 18 are +20 V in HIGH and -10 V in LOW.

[0051] Next, at Time t1, the scanning line driving circuit 4 changes the voltage level of the scanning line 17 from LOW to HIGH to bring the switching transistors 11 and 12 into an on state. FIG. 5A is a diagram showing a pixel circuit in a conductive state while a signal voltage is being written by the image display device according to the first illustrative embodiment. As shown in the diagram, the reference voltage VREF of the reference power source line 20 is applied to the electrode 131 of the electrostatic capacitor 13, and the signal voltage Vdata is applied from the signal line 16 to the electrode 132 of the electrostatic capacitor 13 (Step S12 in FIG. 4). In other words, in Step S12, charge corresponding to the signal voltage to be applied to the luminescence pixel 10 is held by the electrostatic capacitor 13.

[0052] In addition, the source of the driving transistor 14 and the electrode 132 of the electrostatic capacitor 13 are non-conductive by the operation of Step S11. Further, the reference voltage VREF of the reference power source line 20 is applied to the gate of the driving transistor 14, and the potential for bringing the driving transistor 14 into an off state is set. Thus, no current flows between the source and drain of the driving transistor 14 at this time, and therefore the organic EL element does not emit light. For example, in this embodiment, the voltage levels of the scanning line 17 are +20 V in HIGH and -10 V in LOW. In addition, VREF is set at 0 V, and Vdata is set to be a value within -5 V to 0 V.

[0053] Since the voltage level of the scanning line 17 is set to be HIGH during the period from Time t1 to Time t2, the signal voltage Vdata is applied from the signal line 16 to the electrode 132 of the luminescence pixel 10, and at the same time, the signal voltage is supplied to each of the luminescence pixels belonging to the pixel line including the luminescence pixel 10.

[0054] Only the capacitive load is connected to the reference power source line 20 during this period, no voltage fall due to a steady current occurs. In addition, the difference in the potential of the drain and source of the switching transistor 12 is 0 V when charging of the electrostatic capacitor 13 is completed. This is true of the relationship between the signal line 16 and the switching transistor 11. Thus, potential VREF and Vdata exactly corresponding to the signal voltage are written into the electrodes 131 and 132 of the electrostatic capacitor 13.

[0055] Next, at Time t2, the scanning line driving circuit 4 changes the voltage level of the scanning line 17 from HIGH to LOW to bring the switching transistor 19 into an off state. This shuts off electricity between the electrode 131 of the electrostatic capacitor 13 and the reference power source line 20, and between the electrode 132 of the electrostatic capacitor 13 and the signal line 16 (Step S13 in FIG. 4).

[0056] Next, at Time t3, the scanning line driving circuit 4 changes the voltage level of the scanning line 18 from LOW to HIGH to bring the switching transistor 19 into an on state. FIG. 5B is a diagram showing a pixel circuit in a conductive state while the image display the first illustrative embodiment device according to the first illustrative embodiment is emitting light. As shown in the diagram, the source of the driving transistor 14 and the electrode 132 of the electrostatic capacitor 13 become conductive (Step S14 in FIG. 4). In addition, the electrode 131 and the electrode 132 of the electrostatic capacitor 13 are cut off from the reference power source line 20 and the signal line 16, respectively. Thus, the gate potential of the driving transistor 14 changes with variation in the source potential, and a both-end voltage (VREF -

Vdata) of the electrostatic capacitor 13 is applied to the gate and source. Thereby, a signal current corresponding to the both-end voltage (VREF - Vdata) flows into the organic EL element 15. For example, in this embodiment, the source potential of the driving transistor 14 changes from 0 V to 10 V by conduction of the switching transistor 19. In addition, the voltage VDD of the positive power source line is set at +20 V, and the voltage VEE of the negative power source line is set at 0 V.

[0057] During the period from Time t3 to Time t4, the both-end voltage (VREF - Vdata) is being applied to between the gate and source, and the flow of the signal current causes the organic EL element 15 to keep emitting light.

[0058] The period from Time t0 to Time t4 corresponds to a frame period by which the light emission intensity of all the luminescence pixels included in the image display device 1 is updated, and operations as in the period from t0 to t4 are repeated at and after t4.

[0059] FIG. 3B is a chart showing operation timings in a Variation of a method of controlling the image display device according to the first illustrative embodiment.

[0060] First, at Time t10, the scanning line driving circuit 4 concurrently executes an operation at Time t0 shown in FIG. 3A in Embodiment 1 and an operation at Time t1 shown in FIG. 3A (Steps S11 and S12 in FIG. 4). In other words, the source of the driving transistor 14 and the electrode 132 of the electrostatic capacitor 13 become non-conductive. At the same time, the reference voltage VREF is applied to the electrode 131 of the electrostatic capacitor 13, and the signal voltage Vdata is applied to the electrode 132.

[0061] A state realized during the period from Time t10 to Time t11 is similar to the state realized during the period from Time t1 to Time t2 shown in FIG. 3A in Embodiment 1. Since the voltage level of the scanning line 17 is set to be HIGH, the signal voltage Vdata is applied from the signal line 16 to the electrode 132 of the luminescence pixel 10, and at the same time, the signal voltage is supplied to each of the luminescence pixels belonging to the pixel line including the luminescence pixel 10.

[0062] In this period, only the capacitive load is connected to the reference power source line 20, and thus no voltage fall due to a steady current occurs. In addition, the difference in the potential of the drain and source of the switching transistor 12 is 0 V when charging of the electrostatic capacitor 13 is completed. This is true of the relationship between the signal line 16 and the switching transistor 11. Thus, potential VREF and Vdata exactly corresponding to the signal voltage are written into the electrodes 131 and 132 of the electrostatic capacitor 13.

[0063] Next, at Time t11, the scanning line driving circuit 4 concurrently executes an operation at Time t2 shown in FIG. 3A in Embodiment 1, and an operation at Time t3 shown in FIG. 3A (Steps S13 and S14 in FIG. 4). In other words, the electrode 131 of the electrostatic capacitor 13 and the reference power source line 20 become non-conductive, and the electrode 132 of the electrostatic capacitor 13 and the signal line 16 are non-conductive, whereas the source of the driving transistor 14 and the electrode 132 of the electrostatic capacitor 13 become conductive. At this time, the both-end voltage (VREF - Vdata) of the electrostatic capacitor 13 is applied to between the gate and source of the driving transistor 14, thereby causing a signal current corresponding to the both-end voltage (VREF - Vdata) to flow into the organic EL element 15.

[0064] During the period from Time t11 to Time t12, the both-end voltage (VREF - Vdata) is being applied to between the gate and source, and the flow of the signal current causes the organic EL element 15 to keep emitting light.

[0065] The period from Time t10 to Time t12 corresponds to a frame period by which the light emission intensity of all the luminescence pixels included in the image display device 1 is updated, and operations as in the period from t10 to t12 are repeated at and after t12.

[0066] As described above, with the image display device and the method of controlling the same according to Embodiment 1 of the present invention, only a current passing through a luminescence element flows into a driving transistor, and no steady current flows in a power source line and a signal line. Thus, it is possible to store an accurate potential into both end electrodes of the electrostatic capacitor having a function of holding a voltage to be applied to between the gate and source of the driving transistor, thereby achieving a highly accurate image display reflecting a video signal.

[0067] It is to be noted that, in this embodiment, it is possible to control a timing in Time t3 and Time t4 for the scanning line 18 independently of a timing for the scanning line 17 in the operation timings shown in FIG. 3A, thereby arbitrarily adjusting light emitting time in a frame period, that is, adjusting duty control. On the other hand, as for the operation timings shown in FIG. 3B, the scanning lines 17 and 18 cooperate. This simplifies the scanning line control circuit, thereby reducing the circuit size. In the case where the switching transistor 11 and the switching transistor 12 are of n(p)-type, and the switching transistor 19 is of p(n)-type, it is possible to reduce the number of outputs of the scanning line driving circuit 4 by configuring the scanning lines 17 and 18 as a common line, whereas it is impossible to perform duty control and thus 100 % light emission is kept in a frame period.

[Second illustrative embodiment]

[0068] The second embodiment described herebelow does not form part of the invention but represents background art that is usefull for understanding the invention.

[0069] An image display device in this embodiment includes luminous pixels arranged in a matrix. Each of the luminous pixels includes: a luminescence element; a capacitor; a driving element having a gate connected to a first electrode of the capacitor and having a source connected to the luminescence element; a third switching element for switching between conductive and non-conductive states between the source of the driving element and the second electrode of the capacitor; a first switching element for switching between conductive and non-conductive states between a reference power source line and a second electrode of the capacitor; and a second switching element for switching between conductive and non-conductive states between a data line and a first electrode of the capacitor. This configuration enables storage of an accurate potential corresponding to a signal voltage onto both end terminals of the capacitor. This makes it possible to achieve an accurate image display reflecting a video signal.

[0070] The second illustrative embodiment will be described below with reference to the drawings.

[0071] FIG. 6 is a diagram showing a circuit configuration of a luminescence pixel included in a display unit and connections with the surrounding circuits according to the second illustrative embodiment. The luminescence pixel 30 in the diagram includes switching transistors 19, 31, and 32, an electrostatic capacitor 13, a driving transistor 14, an organic EL element 15, a signal line 16, scanning lines 17 and 18, a reference power source line 20, a positive power source line 21, and a negative power source line 22. In addition, the surrounding circuits include a scanning line driving circuit 4 and a signal line driving circuit 5.

[0072] The luminescence pixel 30 according to this embodiment is structurally different from the luminescence pixel 10 according to Embodiment 1 only in the connection of the switching transistor to the both end electrodes of the electrostatic capacitor 13.

[0073] The connection relationships and functions of the structural elements shown in FIG. 6 will be described below in terms of the differences from the structural elements according to Embodiment 1 shown in FIG. 2 and the already-given descriptions are not repeated.

[0074] The scanning line driving circuit 4 is connected to the scanning lines 17 and 18, and functions as a driving circuit for controlling between conductive and non-conductive states of the switching transistors 19, 31, and 32 included in the luminescence pixel 30 by outputting a scanning signal to the scanning lines 17 and 18.

[0075] The signal line driving circuit 5 is connected to the signal line 16, and functions as a driving circuit for outputting a signal voltage based on a video signal to the luminescence pixel 30.

[0076] The switching transistor 31, as the second switching element, has a gate connected to the scanning line 17 that is the second scanning line, and has a source and drain one of which is connected to the signal line 16 that is the data line and the other of which is connected to an electrode 131 of the electrostatic capacitor 13. The switching transistor 31 has a function of determining a timing with which the signal voltage of the signal line 16 is applied to the electrode 131 of the electrostatic capacitor 13.

[0077] The switching transistor 32, as the first switching element, has a gate connected to the scanning line 17 that is the first scanning line, and has a source and drain one of which is connected to the reference power source line 20 and the other of which is connected to an electrode 132 of the electrostatic capacitor 13. The switching transistor 32 has a function of determining a timing with which the reference voltage VREF of the reference power source line 20 is applied to the electrode 132 of the electrostatic capacitor 13. The switching transistors 31 and 32 are configured in form of n-type thin film transistors (n-type TFTs).

[0078] The electrostatic capacitor 13 holds the charge corresponding to the signal voltage supplied from the signal line 16. In the case where the switching transistors 31 and 32 are brought into an off state, the electrostatic capacitor 13 exerts the function of causing the driving transistor 14 to hold a constant potential between its gate and source electrodes, and thereby stabilizing a current to be supplied from the driving transistor 14 to the organic EL element 15.

[0079] The signal line 16 is connected to a signal line driving circuit 5, and to each of luminescence pixels belonging to a pixel column including the luminescence pixel 30, and has a function of supplying a signal voltage that determines the luminance intensity of the pixels.

[0080] In addition, the image display device according to Embodiment 2 includes signal lines 16 in number corresponding to the number of pixel columns.

[0081] With this, the scanning line 17 has a function of supplying a timing with which the signal voltage is written into each of the luminescence pixels belonging to the pixel line including the luminescence pixel 30, and a function of supplying a timing with which the reference voltage VREF is applied to the gate of the driving transistor 14 included in the luminescence pixel.

[0082] Next, a description is given of a method of controlling the image display device according to this embodiment with reference to FIGS. 3A to 7.

[0083] FIG. 3A is a chart showing operation timings in a method of controlling the image display device according to the second illustrative embodiment. In addition, FIG. 7 is a flowchart of operations performed by the image display device according to Embodiment 2 of the present invention.

[0084] First, at Time t0, the scanning line driving circuit 4 changes the voltage level of the scanning line 18 from HIGH to LOW to bring the switching transistor 19 into an off state. With this, the source of the driving transistor 14 and the electrode 132 that is the second electrode of the electrostatic capacitor 13 become non-conductive (Step S21 in FIG. 7). For example, in this embodiment, the voltage levels of the scanning line 18 are +20 V in HIGH and -10 V in LOW.

[0085] Next, at Time t1, the scanning line driving circuit 4 changes the voltage level of the scanning line 17 from LOW to HIGH to bring the switching transistors 31 and 32 into an on state. At this time, the signal voltage Vdata is applied from the signal line 16 to the electrode 131 that is the first electrode of the electrostatic capacitor 13, and the reference voltage VREF of the reference power source line 20 is applied to the electrode 132 of the electrostatic capacitor 13 (Step S22 in FIG. 7). In other words, in Step S22, charge corresponding to the signal voltage to be applied to the luminescence pixel 30 is held by the electrostatic capacitor 13.

[0086] In addition, the source of the driving transistor 14 and the electrode 132 of the electrostatic capacitor 13 are non-conductive by the operation of Step S21. The maximum potential VDH of the signal line 16 is set to a potential that brings the driving transistor 14 into an off state upon application at its gate. Thus, no current flows between the source and drain of the driving transistor 14 at this time, and therefore the organic EL element does not emit light. For example, in this embodiment, VREF, Vdate, VDD, and VEE are set to 0 V, -5 V (VDH) to 0 V, +20 V, and 0 V, respectively.

[0087] Further, the maximum signal potential VDH of the potential VREF of the reference power source line 20 is adjusted so as to supply a current having the maximum signal value to the organic EL element 15 when the voltage between the gate and source of the driving transistor 14 is the voltage (VDH - VREF) in later-described Step S24.

[0088] Since the voltage level of the scanning line 17 is set to be HIGH during the period from Time t1 to Time t2, the signal voltage Vdata is applied from the signal line 16 to the electrode 131 of the luminescence pixel 30, and at the same time, the signal voltage is supplied to each of the luminescence pixels belonging to the pixel line including the luminescence pixel 30.

[0089] During this period, the electrodes 131 and 132 of the electrostatic capacitor 13 are separated from the positive power source line 21 which supplies a current to the organic EL element 15, the negative power source line 22, and the anode of the organic EL element 15. Accordingly, only the capacitive load is connected to the reference power source line 20, and thus no voltage fall due to a steady current occurs. In addition, the difference in the potential of the drain and source of the switching transistor 32 is 0 V when charging of the electrostatic capacitor 13 is completed. This is true of the relationship between the signal line 16 and the switching transistor 31. In this way, the voltage Vdata and VREF exactly corresponding to the signal voltage are written into each of the electrodes 131 and 132 of the electrostatic capacitor 13.

[0090] Next, at Time t2, the scanning line driving circuit 4 changes the voltage level of the scanning line 17 from HIGH to LOW to bring the switching transistors 31 and 31 into an off state. This shuts off electricity between the electrode 131 of the electrostatic capacitor 13 and the signal line 16, and between the electrode 132 of the electrostatic capacitor 13 and the reference power source line 20 (Step S23 in FIG. 7).

[0091] Next, at Time t3, the scanning line driving circuit 4 changes the voltage level of the scanning line 18 from LOW to HIGH to bring the switching transistor 19 into an on state. At this time, the source of the driving transistor 14 and the electrode 132 of the electrostatic capacitor 13 become conductive (Step S24 in FIG. 7). In addition, the electrode 131 and the electrode 132 of the electrostatic capacitor 13 are cut off from the signal line 16 and the reference power source line 20, respectively. Since the gate potential of the driving transistor 14 changes, and a difference in the potential of both-end voltage (Vdata - VREF) of the electrostatic capacitor 13 is applied, a signal current corresponding to the both-end voltage (Vdata - VREF) flows into the organic EL element 15. For example, in this embodiment, the source potential of the driving transistor 14 changes from +2 V to +10 V by conduction of the switching transistor 19. In addition, the voltage VDD of the positive power source line is set at +20 V, and the voltage VEE of the negative power source line is set at 0 V.

[0092] During the period from Time t3 to Time t4, the both-end voltage (Vdata - VREF) is being applied to between the gate and source, and the flow of the signal current causes the organic EL element 15 to keep emitting light.

[0093] The period from Time t0 to Time t4 corresponds to a frame period by which the light emission intensity of all the luminescence pixels is updated, and operations as in the period from t1 to t4 are repeated at and after t4.

[0094] FIG. 3B is a chart showing operation timings in a Variation of a method of controlling the image display device according to the second illustrative embodiment.

[0095] First, at Time t10, the scanning line driving circuit 4 concurrently executes an operation at Time t0 shown in FIG. 3A in Embodiment 2 and an operation at Time t1 shown in FIG. 3A (Steps S21 and S22 in FIG. 7). In other words, the source of the driving transistor 14 and the electrode 132 of the electrostatic capacitor 13 become non-conductive. At the same time, the signal voltage Vdata is applied to the electrode 131 of the electrostatic capacitor 13, and the reference voltage VREF is applied to the electrode 132.

[0096] A state realized during the period from Time t10 to Time t11 is similar to the state realized during the period from Time t1 to Time t2 shown in FIG. 3A in Embodiment 2. Since the voltage level of the scanning line 17 is set to be HIGH, the signal voltage Vdata is applied from the signal line 16 to the electrode 131 of the luminescence pixel 30, and at the same time, the signal voltage is supplied to each of the luminescence pixels belonging to the pixel line including the luminescence pixel 30.

[0097] In this period, only the capacitive load is connected to the reference power source line 20, and thus no voltage fall due to a steady current occurs. In addition, the difference in the potential of the drain and source of the switching transistor 32 is 0 V when charging of the electrostatic capacitor 13 is completed. This is true of the relationship between the signal line 16 and the switching transistor 31. In this way, the voltage Vdata and VREF exactly corresponding to the signal voltage are written into each of the electrodes 131 and 132 of the electrostatic capacitor 13.

[0098] Next, at Time t11, the scanning line driving circuit 4 concurrently executes an operation at Time t2 shown in FIG. 3A in Embodiment 2, and an operation at Time t3 shown in FIG. 3A (Steps S23 and S24 in FIG. 7). In other words, the electrode 131 of the electrostatic capacitor 13 and the signal line 16 become non-conductive, and the electrode 132 of the electrostatic capacitor 13 and the reference power source line 20 are non-conductive, whereas the source of the driving transistor 14 and the electrode 132 of the electrostatic capacitor 13 become conductive. At this time, the both-end voltage (Vdata - VREF) is applied to between the gate and source of the driving transistor 14, a signal current corresponding to the both-end voltage (Vdata - VREF) flows into the organic EL element 15.

[0099] During the period from Time t11 to Time t12, the both-end voltage (Vdata - VREF) is being applied to between the gate and source, and the flow of the signal current causes the organic EL element 15 to keep emitting light.

[0100] The period from Time t10 to Time t12 corresponds to a frame period by which the light emission intensity of all the luminescence pixels is updated, and operations as in the period from t1 to t12 are repeated at and after t12.

[0101] On the other hand, as for the operation timings shown in FIG. 3B, the scanning lines 17 and 18 cooperate. This simplifies the scanning line control circuit, thereby reducing the circuit size. In the case where the switching transistor 31 and the switching transistor 32 are of n(p)-type, and the switching transistor 19 is of p(n)-type, it is possible to reduce the number of outputs of the scanning line driving circuit 4 by configuring the scanning lines 17 and 18 as a common line.

[0102] As described above, with the image display device and the method of controlling the same according to the second illustrative embodiment, only a current passing through a luminescence element flows into a driving transistor, and no steady current flows in a power source line and a signal line. Thus, it is possible to store an accurate potential into both end electrodes of the electrostatic capacitor having a function of holding a voltage to be applied to between the gate and source of the driving transistor, thereby achieving a highly accurate image display reflecting a video signal.

[Embodiment 3]

[0103] An image display device in this embodiment includes luminescence pixels arranged in a matrix. Each of the luminous pixels includes: a luminescence element; a capacitor; a driving element having a gate connected to a first electrode of the capacitor and having a source connected to the luminescence element; a third switching element for switching between conductive and non-conductive states between the source of the driving element and the second electrode of the capacitor; a first switching element for switching between conductive and non-conductive states between a first reference power source line and a first electrode of the capacitor; a second switching element for switching between conductive and non-conductive states between a data line and a second electrode of the capacitor, and a second capacitor connected to between the second electrode of the capacitor and the second reference power source line. This configuration enables storage of an accurate potential corresponding to a signal voltage onto both end terminals of the capacitor, thereby achieving a light emission which is constant irrespective of whether the third switching element is in an on state or in an off state.

[0104] An embodiment of the present invention will be described below with reference to the drawings.

[0105] FIG. 8 is a diagram showing a circuit configuration of a luminescence pixel included in a display unit and connections with the surrounding circuits according to Embodiment 3 of the present invention. The luminescence pixel 40 in the diagram includes switching transistors 11, 12, and 19, electrostatic capacitors 13 and 41, a driving transistor 14, an organic EL element 15, a signal line 16, scanning lines 17 and 18, a reference power source line 20, a positive power source line 21, and a negative power source line 22. In addition, the surrounding circuits include a scanning line driving circuit 4 and a signal line driving circuit 5.

[0106] The luminescence pixel 40 according to this embodiment is structurally different from the luminescence pixel 10 according to Embodiment 1 only in that the electrostatic capacitor 41 is connected between the electrode 132 of the electrostatic capacitor 13 and the reference power source line 20.

[0107] The connection relationships and functions of the structural elements shown in FIG. 8 will be described in terms of the differences from the structural elements according to Embodiment 1 shown in FIG. 2, and the already-given descriptions are not repeated.

[0108] The electrostatic capacitor 41 is the second capacitor connected between the electrode 132 that is the second electrode of the electrostatic capacitor 13 and the reference power source line 20 that is the fourth power source line. First, the electrostatic capacitor 41 stores the constant source potential of the driving transistor 14 in a state where the switching transistor 19 is conductive. Since the potential of the electrode 132 of the electrostatic capacitor 13 is fixed even after the switching transistor 19 is brought into an off state, the gate voltage of the driving transistor 14 is also fixed. On the other hand, the potential of the driving transistor 14 is already constant. As a result, the electrostatic capacitor 41 has a function of stabilizing the voltage between the gate and source of the driving transistor 14.

[0109] It is to be noted that the electrostatic capacitor 41 may be connected to a reference power source line other than the reference power source line 20 that is the first power source line connected to one of the source and drain of the switching transistor 12. For example, the electrostatic capacitor 41 may be a positive power source VDD or a negative power source VEE. In this case, the layout flexibility increases, and thus a wide space is secured between elements, thereby achieving an increased yield.

[0110] On the other hand, as in this embodiment, the use of a common reference power source makes it possible to reduce the number of reference power source lines, thereby simplifying the pixel circuitry.

[0111] Next, a description is given of a method of controlling the image display device according to this embodiment with reference to FIGS. 9 to 10.

[0112] FIG. 9 is a chart showing operation timings in a method of controlling an image display device according to Embodiment 3 of the present invention. In addition, FIG. 10 is a flowchart of operations performed by the image display device according to Embodiment 3 of the present invention.

[0113] Next, at Time t20, the scanning line driving circuit 4 changes the voltage level of the scanning line 17 from LOW to HIGH to bring the switching transistors 11 and 12 into an on state. At this time, the reference voltage VREF is applied to the electrode 131 that is the first electrode of the electrostatic capacitor 13, and the signal voltage Vdata is applied from the signal line 16 to the electrode 132 that is the second electrode of the electrostatic capacitor 13 (Step S31 in FIG. 10). In other words, in Step S31, charge corresponding to the signal voltage to be applied to the luminescence pixel 40 is held by the electrostatic capacitor 13.

[0114] Since the voltage level of the scanning line 17 is set to be HIGH during the period from Time t20 to Time t21, the signal voltage Vdata is applied from the signal line 16 to the electrode 132 of the luminescence pixel 40, and at the same time, the signal voltage is supplied to each of the luminescence pixels belonging to the pixel line including the luminescence pixel 40.

[0115] In this period, only the capacitive load is connected to the reference power source line 20, and thus no voltage fall due to a steady current occurs. Thus, the difference in the potential generated between the drain and source of the switching transistor 12 is 0 V when charging of the electrostatic capacitor 13 is completed. This is true of the relationship between the signal line 16 and the switching transistor 11. Thus, potential VREF and Vdata exactly corresponding to the signal voltage are written into the electrodes 131 and 132 of the electrostatic capacitor 13.

[0116] Next, at Time t21, the scanning line driving circuit 4 changes the voltage level of the scanning line 17 from HIGH to LOW to bring the switching transistors 11 and 12 into an off state. This conducts electricity between the electrode 131 of the electrostatic capacitor 13 and the reference power source line 20, and between the electrode 132 of the electrostatic capacitor 13 and the signal line 16 (Step S32 in FIG. 10).

[0117] At Time t21' later than Time t21 by a minute time, the scanning line driving circuit 4 changes the voltage level of the scanning line 18 from LOW to HIGH to turn on the switching transistor 19. With this, the source of the driving transistor 14 and the electrode 132 of the electrostatic capacitor 13 become conductive (Step S32 in FIG. 10). In addition, the electrode 131 and the electrode 132 of the electrostatic capacitor 13 are cut off from the reference power source line 20 and the signal line 16, respectively. Thus, the gate potential of the driving transistor 14 changes, and a both-end voltage (VREF - Vdata) of the electrostatic capacitor 13 is applied to between the gate and source. Thereby, a signal current corresponding to the both-end voltage (VREF - Vdata) flows into the organic EL element 15. In this embodiment, the source potential of the driving transistor 14, the voltage VDD of the positive power source line, and the voltage VEE of the negative power source line are, for example, the same as the voltages described in Embodiment 1.

[0118] During the period from Time t21' to Time t22, the both-end voltage (VREF - Vdata) is being applied between the gate and source, and the flow of the signal current causes the organic EL element 15 to keep emitting light.

[0119] Next, at Time t22, the scanning line driving circuit 4 changes the voltage level of the scanning line 18 from HIGH to LOW to bring the switching transistor 19 into an off state (Step S33 in FIG. 10). At this time, as long as the source potential of the driving transistor 14 is in a steady state, the electrostatic capacitor 41 stores the source potential even when the switching transistor 19 is in an off state. Thus, the potential of the electrode 132 of the electrostatic capacitor 13 is fixed, resulting in stabilization of the potential of the electrode 13, that is, the gate potential of the driving transistor 14. On the other hand, since the source potential of the driving transistor 14 is constant during a steady state, the voltage between the gate and source of the driving transistor 14 is stabilized. In other words, the signal current is stabilized as long as the source potential of the driving transistor 14 is in a steady state, irrespective of whether the switching transistor 19 is in an on state or in an off state.

[0120] As long as the aforementioned operations enable the luminescence pixel 40 to enter into a steady state within a horizontal period, the scanning signal waveform of and the timing for the scanning line 18 can be made the same as the scanning signal waveform of and the timing for the scanning line 17 connected to the luminescence pixel positioned downstream in the same column.

[0121] FIG. 11 is a diagram showing a circuit configuration of a luminescence pixel included in a display unit and connections with the surrounding circuits according to Embodiment 3 of the present invention. The luminescence pixel 10A in the diagram includes: switching transistors 11A, 12A, and 19A; electrostatic capacitors 13A and 41A; a driving transistor 14A; an organic EL element 15A; a signal line 16; scanning lines 17A and 17B; a reference power source line 20; a positive power source line 21; and a negative power source line 22. In addition, the electro-luminescence pixel 10B includes: switching transistors 11B, 12B, and 19B; electrostatic capacitors 13B and 41B; a driving transistor 14B; an organic EL element 15B; a signal line 16; scanning lines 17B and 17C; a reference power source line 20; a positive power source line 21; and a negative power source line 22. In addition, the surrounding circuits include a scanning line driving circuit 4 and a signal line driving circuit 5.

[0122] The circuit configurations of the luminescence pixels 10A and 10B and the functions of the respective structural elements in each circuit are the same as in those of the luminescence pixel 40 shown in FIG. 8, and thus the same descriptions are not repeated here.

[0123] The luminescence pixel 10B is in the same pixel column in which the luminescence pixel 10A is positioned, and is positioned downstream of the luminescence pixel 10A by a line.

[0124] The scanning line 17B connected to the luminescence pixel 10A is connected also to the luminescence pixel 10B.

[0125] Next, a description is given of a method of controlling the image display device according to this embodiment with reference to FIGS. 12 to 13.

[0126] FIG. 12 is a chart showing operation timings in a method of controlling luminescence pixels in the image display device according to Embodiment 3 of the present invention. FIG. 13 is an operation flowchart indicating a Variation of a luminescence pixel in the image display device according to Embodiment 3 of the present invention.

[0127] First, at Time t30, the scanning line driving circuit 4 changes the voltage level of the scanning line 17A from LOW to HIGH to bring the switching transistors 11A and 12A into an on state. At this time, the reference voltage VREF of the reference power source line 20 is applied to the electrode 131A that is the first electrode of the electrostatic capacitor 13A, and the signal voltage $V_A$data is applied to the electrode 132A that is the second electrode (Step S41 in FIG. 13).

[0128] Since the voltage level of the scanning line 17A is HIGH during the period from Time t30 to Time t31, the signal voltage $V_A$data is applied from the signal line 16 to the electrode 132A of the luminescence pixel 10A that is a pixel A, and at the same time, the signal voltage Is supplied to each of the luminescence pixels belong to the pixel line in which the luminescence pixel 10A is included.

[0129] In this period, an accurate potential corresponding to the signal voltage $V_A$data is written into the electrostatic capacitor 13A.

[0130] Next, at Time t31, the scanning line driving circuit 4 changes the voltage level of the scanning line 17A from HIGH to LOW to bring the switching transistors 11A and 12A into an off state. This shuts off electricity between the electrode 131A of the electrostatic capacitor 13A and the reference power source line 20, and between the electrode 132A of the electrostatic capacitor 13A and the signal line 16 (Step S42 in FIG. 13).

[0131] At Time t31' later than Time t31 by a minute time, the scanning line driving circuit 4 changes the voltage level of the scanning line 17B from LOW to HIGH to turn on the switching transistor 19A. With this, the source of the driving transistor 14A and the electrode 132A of the electrostatic capacitor 13A become conductive (Step S42 in FIG. 13). In addition, the electrode 131A of the electrostatic capacitor 13A is cut off from the reference power source line 20, and the electrode 132A is cut off from the signal line 16. Thus, the gate potential of the driving transistor 14A changes, and a signal current corresponding to the voltage (VREF - $V_A$data) flows into the organic EL element 15A.

[0132] In addition, at Time t31', the scanning line driving circuit 4 turns on the switching transistors 11B and 12B in the luminescence pixel 10B that is a pixel B by changing the voltage level of the scanning line 17B from LOW to HIGH. At this time, the reference voltage VREF of the reference power source line 20 is applied to the electrode 131B that is the first electrode of the electrostatic capacitor 13B, and the signal voltage $V_B$data is applied from the signal line 16 to the electrode 132B that is the second electrode (Step S42 in FIG. 13).

[0133] Since the voltage level of the scanning line 17B is HIGH during the period from Time t31 to Time t32, the signal voltage $V_B$data is applied from the signal line 16 to the electrode 132B of the luminescence pixel 10B, and at the same time, the signal voltage is supplied to each of the luminescence pixels belonging to the pixel line including the luminescence pixel 10B.

[0134] In this period, an accurate potential corresponding to the signal voltage $V_B$data is written into the electrostatic capacitor 13B.

[0135] During this period, a both-end voltage (VREF - $V_A$data) of the electrostatic capacitor 13A is being applied to between the gate and source of the driving transistor 14A in the luminescence pixel 10A, and a flow of a driving current enables the organic EL element 15A to keep emitting light.

[0136] Next, at Time t32, the scanning line driving circuit 4 changes the voltage level of the scanning line 17B from HIGH to LOW to bring the switching transistor 19A into an off state (Step S43 in FIG. 13). At this time, the electrostatic capacitor 41A stores the source potential of the driving transistor 14A even when the switching transistor 19A is brought into an off state. Thus, the voltage between the gate and source of the driving transistor 14A is stabilized. In other words, the signal current in the luminescence pixel 10A is stabilized irrespective of whether the switching transistor 19A is in an on state or in an off state.

[0137] In addition, at Time t32, the voltage level of the scanning line 17B changes from HIGH to LOW, thereby turning off the switching transistors 11B and 12B. This shuts off electricity between the electrode 131B of the electrostatic capacitor 13B and the reference power source line 20, and between the electrode 132B of the electrostatic capacitor 13B and the signal line 16 (Step S43 in FIG. 13).

[0138] In addition, at Time t32' later than Time t32 by a minute time, the scanning line driving circuit 4 changes the voltage level of the scanning line 17C from LOW to HIGH to turn on the switching transistor 19B. With this, the source of the driving transistor 14B and the electrode 132B of the electrostatic capacitor 13B become conductive (Step S43 in FIG. 13). In addition, the electrode 131B and the electrode 132B of the electrostatic capacitor 13B are cut off from the reference power source line 20 and the signal line 16, respectively. Thus, the gate voltage of the driving transistor 14B changes, and a driving current corresponding to the voltage (VREF - $V_B$data) flows into the organic EL element 15B.

[0139] During the period from Time t32 to Time t33, a both-end voltage (VREF - $V_B$data) of the electrostatic capacitor 13B is being applied to between the gate and source of the driving transistor 14B in the luminescence pixel 10B, and a flow of a driving current enables the organic EL element 15B to keep emitting light.

[0140] Next, at Time t33, the scanning line driving circuit 4 changes the voltage level of the scanning line 17C from HIGH to LOW to bring the switching transistor 19B into an off state. At this time, the electrostatic capacitor 41B stores the source potential of the driving transistor 14B even when the switching transistor 19B is brought into an off state. Thus, the voltage between the gate and source of the driving transistor 14B is stabilized. In other words, the signal current in the luminescence pixel 10B is stabilized irrespective of whether the switching transistor 19B is in an on state or in an off state.

[0141] Sequentially performing the aforementioned operations in t30 to t33 on the luminescence pixels positioned downstream in the same column makes it possible to enable the pixels to emit light with a constant delay time determined on a line-by-line basis.

[0142] As described above, disposing the electrostatic capacitor 41 that is the second capacitor in the luminescence pixel 10 enables a light emission which is constant irrespective of whether the switching transistor 19 is in an on state or in an off state. This makes it possible to use a common scanning line for luminescence pixels adjacent to each other in a pixel column. This enables reduction in the number of scanning lines for controlling switching transistors, and therefore it is possible to simplify the circuit configuration of the image display device. Further, it is possible to simplify the driving circuits for outputting the scanning signals.

[0143] As described above, configuring a simple pixel circuitry as in each of Embodiments 1 to 3 makes it possible to store the accurate potential corresponding to a signal voltage into both end electrodes of a capacitor which holds a voltage to be applied to between the gate and source of an n-type driving TFT which performs a source grounding operation. This makes it possible to achieve an accurate image display reflecting a video signal. Further, disposing the second capacitor which stores the source potential of the n-type driving TFT stabilizes the voltage between the gate and source of the n-type driving TFT, thereby stabilizing the driving current, that is, achieving a stable light emitting operation.

[0144] It is to be noted that the image display devices according to the present invention is not limited to those in the above-described embodiments.

[0145] For example, a pixel circuitry obtained by combining the second illustrative embodiment and Embodiment 3 is included in the present invention. FIG. 14 is a diagram showing a circuit configuration of a luminescence pixel and connections with the surrounding circuits which are obtained by combining the second illustrative embodiment and embodiment 3 of the present invention. The luminescence pixel 50 shown in the diagram includes switching transistors 19, 31, and 32, electrostatic capacitors 13 and 51, a driving transistor 14, an organic EL element 15, a signal line 16, scanning lines 17 and 18, a reference power source line 20, a positive power source line 21, and a negative power source line 22. In addition, the surrounding circuits include a scanning line driving circuit 4 and a signal line driving circuit 5.

[0146] The luminescence pixel 50 is structurally different from the luminescence pixel 40 according to Embodiment 3 shown in FIG. 8 only in the connection of the switching transistor to the both end electrodes of the electrostatic capacitor 13.

[0147] The electrostatic capacitor 51 is a second capacitor connected between the electrode 132 of the electrostatic capacitor 13 and the reference power source line 20, and has a function of stabilizing the voltage between the gate and source of the driving transistor 14 likewise the electrostatic capacitor 41 included in the luminescence pixel 40 of Embodiment 3.

[0148] Thus, it is possible to use a scanning line for adjacent luminescence pixels as in FIG. 11 also in the display unit including a circuit configuration of the luminescence pixel 50. Accordingly, as in Embodiment 3, it is possible to reduce the number of scanning lines for controlling switching transistors, thereby being able to simplify the circuit configuration of the image display device.

[0149] It is to be noted that the electrostatic capacitor 51 may be connected to a reference power source line other than the reference power source line 20 connected to one of the source and drain of the switching transistor 32. For example, the electrostatic capacitor 41 may be a positive power source line VDD or a negative power source line VEE. In this case, the layout flexibility increases, and thus a wide space is secured between elements, thereby achieving an increased yield.

[0150] Throughout Embodiments 1 to 3, the switching transistors 12 and 32 (first switching elements) and the switching transistors 11 and 31 (second switching elements) are controlled in a same manner using the same scanning line 17. However, it is to be noted that the first switching elements and the second switching elements may be independently turned on or off using different scanning lines (a first scanning line and a second scanning line). In this case, the timing at which a signal voltage is applied from the signal line 16 to the electrostatic capacitor 13 is controlled independently of the timing at which a reference voltage is applied from the reference power source line 20 to the electrostatic capacitor 13. With this, it is also possible to execute duty control for light emission in a frame.

[0151] The above embodiments have been described as n-type transistors which are brought into an on state when the voltage level of the switching transistor is HIGH. However, it is to be noted that image display devices which is configured to include p-type transistors instead of these n-type transistors and have a reversed polarity in the scanning lines provide the same advantageous effects as in those provided by the respective embodiments.

[0152] Further, the above embodiments have been described assuming that the switching transistors are FETs having a gate, a source, and a drain. However, these switching transistors may be bipolar transistors having a base, a collector, and an emitter. In this case, the object of the present invention is achieved, and the same advantageous effects are provided.

[0153] In addition, a display device according to the present invention is embedded, for example, in a thin flat TV as shown in FIG. 15. Embedding an image display device according to the present invention makes it possible to achieve a thin flat TV capable of achieving accurate image display reflecting a video signal.

[Industrial Applicability]

[0154] The present invention is particularly applicable to active-type organic EL flat panel displays which fluctuate luminance by controlling the luminance intensity of pixels using pixel signal currents.

[Reference Signs List]

[0155]

1 Image display device
2 Control circuit
3 Memory
4 Scanning line driving circuit
5 Signal line driving circuit
6 Display unit
10, 10A, 10B, 30, 40, 50 Luminescence pixel
11, 11A, 11B, 12, 12A, 12B, 19, 19A, 19B, 31, 32 Switching transistor
13, 13A, 13B, 41, 41A, 41B, 51 Electrostatic capacitor
14, 14A, 14B Driving transistor
15, 15A, 15B, 505 Organic EL element
16, 506 Signal line
17, 17A, 17B, 17C, 18 Scanning line
20 Reference power source line
21 Positive power source line
22 Negative power source line
131, 131A, 131B, 132, 132A, 132B Electrode
500 Pixel unit
501 First switching element
502 Second switching element
503 Capacitor element
504 N-type thin film transistor (n-type TFT)
507 First scanning line
508 Second scanning line
509 Third switching element

Claims

1. An image display device comprising a plurality of pixel units (10), a data line (16), a signal line driving circuit (5) connected to the data line (16) and adapted to output a signal voltage based on a video signal, and a scanning line driving circuit (4), each pixel unit (10) comprising:

   a luminescence element (15);
   a first capacitor (13);
   a driving transistor (14) which has a gate electrode connected to a first electrode (131) of said first capacitor (13) and a source electrode connected to a first electrode of said luminescence element (15), and is adapted for causing said luminescence element (15) to emit light by applying a drain current corresponding to a voltage held by said first capacitor (13) to said luminescence element (15);
   a second capacitor (41) having a first electrode connected to a second electrode (132) of said first capacitor (13);
   a first power source line (21) electrically connected to said drain electrode of said driving transistor (14);
   a second power source line (22) electrically connected to a second electrode of said luminescence element (15);
   a third power source line (20) adapted for supplying a first reference voltage defining a voltage value of a first electrode (131) of said first capacitor (13);
   a fourth power source line (20) electrically connected to a second electrode of said second capacitor (41), the fourth power source line (20) being adapted for supplying a second reference voltage defining a voltage value of said second electrode of said second capacitor (41);
   a first switch (12) adapted for setting the first reference voltage of said first electrode (131) of said first capacitor (13);
   a second switch (11) adapted for connecting said data line (16) and said second electrode

(132) of said first capacitor (13) to supply the signal voltage to the second electrode (132) of the first capacitor (13); and

a third switch (19) adapted for connecting said first electrode of said luminescence element (15) and said second electrode (132) of said first capacitor (13);

the image display device further comprising a first scanning line (17A) connected to the control inputs of the first switches (12A) of a first row of pixel units (10A), to the control inputs of the second switches (11A) of the first row of pixel units (10A), and a second scanning line (17B) connected to the control inputs of the first switches (12B) of a second row of pixel units (10B) adjacent to the first row of pixel units (10A), to the control inputs of the second switches (11B) of the second row of pixel units (10B), and to the control inputs of the third switches (19A) of the first row of pixel units (10A),

wherein the scanning line driving circuit (4) is connected to the scanning lines (17A, 17B) and adapted for changing a voltage level of the scanning lines (17A, 17B), and

the image display device is adapted to control the signal line driving circuit (5) and the scanning line driving circuit (4) so as to perform the following steps:

maintaining the voltage level of the first scanning line (17A) and the second scanning line (17B) to an off-level so as to turn off the first, second and third switches (12A, 11A, 19A) of the first row of pixel units (10A), then

changing a voltage level of the first scanning line (17A) to an on-level (t30) to turn on the first and second switches (12A, 11A) of the first row of pixel units (10A) while a signal voltage is applied from the data line (16) so as to write a potential corresponding to the signal voltage into the first capacitor (13A) of a pixel unit of the first row of pixel units (10A) while maintaining the second scanning line (17B) to the off-level, then

changing the voltage level of the first scanning line (17A) to the off-level (t31) to turn off the first and the second switches (12A, 11A) of the first row of pixel units (10A) after the potential corresponding to the signal voltage has been written into the first capacitor (13A) of the pixel unit of the first row of pixel units (10A) while maintaining the second scanning line (17B) to the off-level, then

changing a voltage level of the second scanning line (17B) to the on-level (t31') to turn on the third switches (19A) of the first row of pixel units (10A) to allow a drain current corresponding to the voltage held by the first capacitor (13A) of the pixel unit of the first row of pixel units (10A) to flow through its luminescent element (15A) and to turn on the first and second switches (12B, 11B) of the second row of pixel units (10B) while a signal voltage is applied from the data line (16) so as to write a potential corresponding to the signal voltage into the first capacitor (13B) of a pixel unit of the second row of pixel units (10B) while maintaining the first scanning line (17A) to the off-level.

2. An image display device comprising a plurality of pixel units (10), a data line (16), a signal line driving circuit (5) connected to the data line (16) and adapted to output a signal voltage based on a video signal, and a scanning line driving circuit (4), each pixel unit comprising:

a luminescence element (15);

a first capacitor (13);

a driving transistor (14) which has a gate electrode connected to a first electrode (131) of said first capacitor (13) and a source electrode connected to a first electrode of said luminescence element (15), and is adapted for causing said luminescence element (15) to emit light by applying a drain current corresponding to a voltage held by said first capacitor (13) to said luminescence element;

a second capacitor (51) having a first electrode connected to a second electrode (132) of said first capacitor (13);

a first power source line (21) electrically connected to said drain electrode of said driving transistor (14);

a second power source line (22) electrically connected to a second electrode of said luminescence element (15);

a third power source line (20) adapted for supplying a first reference voltage defining a voltage value of a second electrode (132) of said first capacitor (13);

a fourth power source line electrically connected to a second electrode of said second capacitor (51), said fourth power source line being adapted for supplying a second reference voltage defining a voltage value of said second electrode of said second capacitor (51);

a first switch (32) adapted for setting the first reference voltage of said second electrode (132) of said first capacitor (13);

a second switch (31) adapted for connecting said data line (16) and said first electrode (131) of said first capacitor (13) to supply the signal voltage to the first electrode of the first capacitor (13); and

a third switch (19) adapted for connecting said first electrode of said luminescence element (15) and said second electrode (132) of said first capacitor (13);
the image display device further comprising a first scanning line (17A) connected to the control inputs of the first switches (12A) of a first row of pixel units (10A), to the control inputs of the second switches (11A) of the first row of pixel units (10A), and a second scanning line (17B) connected to the control inputs of the first switches (12B) of a second row of pixel units (10B) adjacent to the first row of pixel units (10B), to the control inputs of the second switches (11 B) of the second row of pixel units (10B), and to the control inputs of the third switches (19A) of the first row of pixel units (10A),
wherein the scanning line driving circuit (4) is connected to the scanning lines (17A, 17B) and adapted for changing a voltage level of the scanning lines (17A, 17B), and
the image display device is adapted to control the signal line driving circuit (5) and the scanning line driving circuit (4) so as to perform the following steps:

maintaining the voltage level of the first scanning line (17A) and the second scanning line (17B) to an off-level so as to turn off the first, second and third switches (32A, 31A, 19A) of the first row of pixel units (10A), then
changing a voltage level of the first scanning line (17A) to an on-level (t30) to turn on the first and second switches (32A, 31A) of the first row of pixel units (10A) while a signal voltage is applied from the data line (16) so as to write a potential corresponding to the signal voltage into the first capacitor (13A) of a pixel unit of the first row of pixel units (10A) while maintaining the second scanning line (17B) to the off-level, then
changing the voltage level of the first scanning line (17A) to the off-level (t31) to turn off the first and the second switches (32A, 31 A) of the first row of pixel units (10A) after the potential corresponding to the signal voltage has been written into the first capacitor (13A) of the pixel unit of the first row of pixel units (10A) while maintaining the second scanning line (17B) to the off-level, then
changing a voltage level of the second scanning line (17B) to the on-level (t31') to turn on the third switches (19A) of the first row of pixel units (10A) to allow a drain current corresponding to the voltage held by the first capacitor (13A) of the pixel unit of the first row of pixel units (10A) to flow through its luminescent element (15A) and to turn on the first and second switches (32B, 31 B) of the second row of pixel units (10B) while a signal voltage is applied from the data line (16) so as to write a potential corresponding to the signal voltage into the first capacitor (13B) of a pixel unit of the second row of pixel units (10B) while maintaining the first scanning line (17A) to the off-level.

3. The image display device according to Claim 1 or 2, wherein said first electrode of said luminescence element (15) is an anode electrode, and said second electrode of said luminescence element (15) is a cathode electrode, and
a voltage of said first power source line (21) is higher than a voltage of said second power source line (22), and a current flows from said first power source line (21) to said second power source line (22).

4. The image display device according to one of Claims 1 to 3, wherein the second capacitor (41; 51) is adapted for storing a source potential of the driving transistor (14) while the third switch (19) is in an off state so that a current flowing through the luminescence element (15) is stabilized irrespective of whether the third switch (19) is in an on state or in an off state.

5. The image display device according to Claim 1 or 2, wherein said third power source line (20) and said fourth power source line (20) are provided as a common power source line.

6. The image display device according to one of Claims 1 to 5, wherein said luminescence element (15) is an organic electro-luminescence (EL) element.

7. A method of controlling an image display device with a plurality of pixel units (10), a data line (16), a signal line driving circuit (5) connected to the data line (16) and adapted to output a signal voltage based on a video signal, and a scanning line driving circuit (4), each pixel unit (10) comprising:

a luminescence element (15);
a first capacitor (13);
a driving transistor (14) which has a gate electrode connected to a first electrode (131) of the first capacitor (13) and a source electrode connected to a first electrode of the luminescence element (15), and is adapted for causing the luminescence element (15) to emit light by applying a drain current corresponding to a voltage held by the first capacitor (13) to the luminescence element (15);
a second capacitor (41) having a first electrode connected to a second electrode (132) of the first capacitor (13);

a first power source line (21) electrically connected to the drain electrode of the driving transistor (14);
a second power source line (22) electrically connected to the second electrode of the luminescence element (15);
a third power source line (20) adapted for supplying a first reference voltage defining a voltage value of a first electrode (131) of the first capacitor (13);
a fourth power source line (20) electrically connected to a second electrode of the second capacitor (41), the fourth power source line (20) being adapted for supplying a second reference voltage defining a voltage value of the second electrode of the second capacitor (41);
a first switch (12) adapted for setting the reference voltage of the first electrode (131) of the first capacitor (13);
a second switch (11) adapted for connecting said data line (16) and the second electrode (132) of the first capacitor (13) to supply the signal voltage to the second electrode (132) of the first capacitor (13); and
a third switch (19) adapted for connecting the first electrode of the luminescence element (15) and the second electrode (132) of the first capacitor (13),
the image display device further comprising a first scanning line (17A) connected to the control inputs of the first switches (12A) of a first row of pixel units (10A), to the control inputs of the second switches (11A) of the first row of pixel units (10A), and a second scanning line (17B) connected to the control inputs of the first switches (12B) of a second row of pixel units (10B) adjacent to the first row of pixel units (10A), to the control inputs of the second switches (11 B) of the second row of pixel units (10B), and to the control inputs of the third switches (19A) of the first row of pixel units (10A),
wherein the scanning line driving circuit (4) is connected to the scanning lines (17A, 17B) and is adapted for changing a voltage level of the scanning lines (17A, 17B),
said method comprising
maintaining the voltage level of the first scanning line (17A) and the second scanning line (17B) to an off-level so as to turn off the first, second and third switches (32A, 31 A, 19A) of the first row of pixel units (10A), then
changing a voltage level of the first scanning line (17A) to an on-level (t30) to turn on the first and second switches (32A, 31A) of the first row of pixel units (10A) while a signal voltage is applied from the data line (16) so as to write a potential corresponding to the signal voltage into the first capacitor (13A) of a pixel unit of the first row of pixel units (10A) while maintaining the second scanning line (17B) to the off-level, then
changing the voltage level of the first scanning line (17A) to the off-level (t31) to turn off the first and the second switches (32A, 31A) of the first row of pixel units (10A) after the potential corresponding to the signal voltage has been written into the first capacitor (13A) of the pixel unit of the first row of pixel units (10A) while maintaining the second scanning line (17B) to the off-level, then
changing a voltage level of the second scanning line (17B) to the on-level (t31') to turn on the third switches (19A) of the first row of pixel units (10A) to allow a drain current corresponding to the voltage held by the first capacitor (13A) of the pixel unit of the first row of pixel units (10A) to flow through its luminescent element (15A) and to turn on the first and second switches (32B, 31 B) of the second row of pixel units (10B) while a signal voltage is applied from the data line (16) so as to write a potential corresponding to the signal voltage into the first capacitor (13B) of a pixel unit of the second row of pixel units (10B) while maintaining the first scanning line (17A) to the off-level.

8. A method of controlling an image display device with a plurality of pixel units (10), a data line (16), a signal line driving circuit (5) connected to the data line (16) and adapted to output a signal voltage based on a video signal, and a scanning line driving circuit (4), each pixel unit (10) comprising:

a luminescence element (15);
a first capacitor (13);
a driving transistor (14) which has a gate electrode connected to a first electrode (131) of the first capacitor (13) and a source electrode connected to a first electrode of the luminescence element (15), and is adapted for causing the luminescence element (15) to emit light by applying a drain current corresponding to a voltage held by the first capacitor (13) to the luminescence element (15);
a second capacitor (51) having a first electrode connected to a second electrode (132) of the first capacitor (13);
a first power source line (21) electrically connected to the drain electrode of the driver driving transistor (14);
a second power source line (22) electrically connected to a second electrode of the luminescence element (15);
a third power source line (20) adapted for supplying a first reference voltage defining a voltage value of a second electrode (132) of the first capacitor (13);

a fourth power source line electrically connected to said second electrode of said second capacitor (51), said fourth power source line being adapted for supplying a second reference voltage defining a voltage value of a second electrode of the second capacitor (51);
a first switch (32) adapted for setting the first reference voltage of the second electrode of the first capacitor (13);
a second switch (31) adapted for connecting the data line (16) and the first electrode (131) of the first capacitor (13) to supply the signal voltage to the second first electrode of the first capacitor (13); and
a third switch (19) adapted for connecting the first electrode of the luminescence element (15) and the second electrode (132) of the first capacitor (13),
the image display device further comprising a first scanning line (17A) connected to the control inputs of the first switches (12A) of a first row of pixel units (10A), to the control inputs of the second switches (11A) of the first row of pixel units (10A), and a second scanning line (17B) connected to the control inputs of the first switches (12B) of a second row of pixel units (10B) adjacent to the first row of pixel units (10A), to the control inputs of the second switches (11 B) of the second row of pixel units (10B), and to the control inputs of the third switches (19A) of the first row of pixel units (10A),
wherein the scanning line driving circuit (4) is connected to the scanning lines (17A, 17B) and is adapted for changing a voltage level of the scanning lines (17A, 17B),
said method comprising
maintaining the voltage level of the first scanning line (17A) and the second scanning line (17B) to an off-level so as to turn off the first, second and third switches (32A, 31A, 19A) of the first row of pixel units (10A), then
changing a voltage level of the first scanning line (17A) to an on-level (t30) to turn on the first and second switches (32A, 31A) of the first row of pixel units (10A) while a signal voltage is applied from the data line (16) so as to write a potential corresponding to the signal voltage into the first capacitor (13A) of a pixel unit of the first row of pixel units (10A) while maintaining the second scanning line (17B) to the off-level, then changing the voltage level of the first scanning line (17A) to the off-level (t31) to turn off the first and the second switches (32A, 31A) of the first row of pixel units (10A) after the potential corresponding to the signal voltage has been written into the first capacitor (13A) of the pixel unit of the first row of pixel units (10A) while maintaining the second scanning line (17B) to the off-level, then
changing a voltage level of the second scanning line (17B) to the on-level (t31') to turn on the third switches (19A) of the first row of pixel units (10A) to allow a drain current corresponding to the voltage held by the first capacitor (13A) of the pixel unit of the first row of pixel units (10A) to flow through its luminescent element (15A) and to turn on the first and second switches (32B, 31 B) of the second row of pixel units (10B) while a signal voltage is applied from the data line (16) so as to write a potential corresponding to the signal voltage into the first capacitor (13B) of a pixel unit of the second row of pixel units (10B) while maintaining the first scanning line (17A) to the off-level.

Patentansprüche

1. Bildanzeigevorrichtung, die eine Vielzahl von Pixel-Einheiten (10), eine Datenleitung (16), eine Spaltenleitungs-Treiberschaltung (5), die mit der Datenleitung (16) verbunden und zum Ausgeben einer Signalspannung auf Basis eines Video-Signals eingerichtet ist, sowie eine Zeilenleitungs-Treiberschaltung (4) umfasst, wobei jede Pixel-Einheit (10) umfasst:

ein Lumineszenz-Element (15);
einen ersten Kondensator (13);
einen Treibertransistor (14), der eine Gate-Elektrode, die mit einer ersten Elektrode (131) des ersten Kondensators (13) verbunden ist, sowie eine Source-Elektrode hat, die mit einer ersten Elektrode des Lumineszenz-Elementes (15) verbunden ist, und der so eingerichtet ist, dass er das Lumineszenz-Element (15) veranlasst, Licht zu emittieren, indem er einen Drain-Strom, der einer von dem ersten Kondensator (13) gespeicherten Spannung entspricht, an das Lumineszenz-Element (15) anlegt;
einen zweiten Kondensator (41), der eine erste Elektrode hat, die mit einer zweiten Elektrode (132) des ersten Kondensators (13) verbunden ist;
eine erste Stromquellen-Leitung (21), die elektrisch mit der Drain-Elektrode des Treibertransistors (14) verbunden ist;
eine zweite Stromquellen-Leitung (22), die elektrisch mit einer zweiten Elektrode des Lumineszenz-Elementes (15) verbunden ist;
eine dritte Stromquellen-Leitung (20), die zum Zuführen einer ersten Bezugsspannung eingerichtet ist, die einen Spannungswert einer ersten Elektrode (131) des ersten Kondensators (13) bestimmt;
eine vierte Stromquellen-Leitung (20), die elek-

trisch mit einer zweiten Elektrode des zweiten Kondensators (41) verbunden ist, wobei die vierte Stromquellen-Leitung (20) zum Zuführen einer zweiten Bezugsspannung eingerichtet ist, die einen Spannungswert der zweiten Elektrode des zweiten Kondensators (41) bestimmt;
einen ersten Schalter (12), der zum Einstellen der ersten Bezugsspannung der ersten Elektrode (131) des ersten Kondensators (13) eingerichtet ist;
einen zweiten Schalter (11), der so eingerichtet ist, dass er die Datenleitung (16) und die zweite Elektrode (132) des ersten Kondensators (13) verbindet, um der zweiten Elektrode (132) des ersten Kondensators (13) die Signalspannung zuzuführen; sowie einen dritten Schalter (19), der zum Verbinden der ersten Elektrode des Lumineszenz-Elementes (15) und der zweiten Elektrode (132) des ersten Kondensators (13) eingerichtet ist;
wobei die Bildanzeigevorrichtung des Weiteren eine erste Zeilenleitung (17A) umfasst, die mit den Steuereingängen der ersten Schalter (12A) einer ersten Reihe von Pixel-Einheiten (10A) und den Steuereingängen der zweiten Schalter (11A) der ersten Reihe von Pixel-Einheiten (10A) verbunden ist, sowie eine zweite Zeilenleitung (17B) umfasst, die mit den Steuereingängen der ersten Schalter (12B) einer zweiten Reihe von Pixel-Einheiten (10B), die an die erste Reihe von Pixel-Einheiten (10A) angrenzt, mit den Steuereingängen der zweiten Schalter (11 B) der zweiten Reihe von Pixel-Einheiten (10B) und den Steuereingängen der dritten Schalter (19A) der ersten Reihe von Pixel-Einheiten (10A) verbunden ist,
wobei die Zeilenleitungs-Treiberschaltung (4) mit den Zeilenleitungen (17A, 17B) verbunden und zum Ändern eines Spannungspegels der Zeilenleitungen (17A, 17B) eingerichtet ist, und die Bildanzeigevorrichtung so eingerichtet ist, dass sie die Spaltenleitungs-Treiberschaltung (5) sowie die Zeilenleitungs-Treiberschaltung (4) so steuert, dass die folgenden Schritte durchgeführt werden:

Halten des Spannungspegels der ersten Zeilenleitung (17A) und der zweiten Zeilenleitung (17B) auf einem AUS-Pegel, um so die ersten, die zweiten und die dritten Schalter (12A, 11A, 19A) der ersten Reihe von Pixel-Einheiten (10A) zu öffnen, anschließend
Ändern eines Spannungspegels der ersten Zeilenleitung (17A) auf einen AN-Pegel (t30), um die ersten und die zweiten Schalter (12A, 11A) der ersten Reihe von Pixel-Einheiten (10A) zu schließen, während gleichzeitig eine Signalspannung von der Datenleitung (16) angelegt wird, und damit ein Potenzial, das der Signalspannung entspricht, in den ersten Kondensator (13A) einer Pixel-Einheit der ersten Reihe von Pixel-Einheiten (10A) zu schreiben und dabei die zweite Zeilenleitung (17B) auf dem AUS-Pegel zu halten, anschließend
Ändern des Spannungspegels der ersten Zeilenleitung (17A) auf den AUS-Pegel (t31), um die ersten und die zweiten Schalter (12A, 11A) der ersten Reihe von Pixel-Einheiten (10A) auszuschalten, nachdem das der Signalspannung entsprechende Potenzial in den ersten Kondensator (13A) der Pixel-Einheit der ersten Reihe von Pixel-Einheiten (10A) geschrieben worden ist, während gleichzeitig die zweite Zeilenleitung (17B) auf dem AUS-Pegel gehalten wird, anschließend
Ändern eines Spannungspegels der zweiten Zeilenleitung auf den AN-Pegel (t31'), um die dritten Schalter (19A) der ersten Reihe von Pixel-Einheiten (10A) zu schließen und zuzulassen, dass ein Drain-Strom, der der Spannung entspricht, die von dem ersten Kondensator (13A) der Pixel-Einheit der ersten Reihe von Pixel-Einheiten (10A) gespeichert wird, durch sein Lumineszenz-Element (15A) fließt, und die ersten und die zweiten Schalter (12B, 11 B) der zweiten Reihe von Pixel-Einheiten (10B) zu schließen, während gleichzeitig eine Signalspannung von der Datenleitung (16) angelegt wird, und damit ein Potenzial, das der Signalspannung entspricht, in den ersten Kondensator (13B) einer Pixel-Einheit der zweiten Reihe von Pixel-Einheiten (10B) zu schreiben, während gleichzeitig die erste Zeilenleitung (17A) auf dem AUS-Pegel gehalten wird.

2. Bildanzeigevorrichtung, die eine Vielzahl von Pixel-Einheiten (10), eine Datenleitung (16), eine Spaltenleitungs-Treiberschaltung (5), die mit der Datenleitung (16) verbunden und zum Ausgeben einer Signalspannung auf Basis eines Video-Signals eingerichtet ist, sowie eine Zeilenleitungs-Treiberschaltung (4) umfasst, wobei jede Pixel-Einheit umfasst:

ein Lumineszenz-Element (15);
einen ersten Kondensator (13);
einen Treibertransistor (14), der eine Gate-Elektrode, die mit einer ersten Elektrode (131) des ersten Kondensators (13) verbunden ist, sowie eine Source-Elektrode hat, die mit einer ersten Elektrode des Lumineszenz-Elementes (15) verbunden ist, und der so eingerichtet ist, dass

er das Lumineszenz-Element (15) veranlasst, Licht zu emittieren, indem er einen Drain-Strom, der einer von dem ersten Kondensator (13) gespeicherten Spannung entspricht, an das Lumineszenz-Element (15) anlegt;
einen zweiten Kondensator (51), der eine erste Elektrode hat, die mit einer zweiten Elektrode (132) des ersten Kondensators (13) verbunden ist;
eine erste Stromquellen-Leitung (21), die elektrisch mit der Drain-Elektrode des Treibertransistors (14) verbunden ist;
eine zweite Stromquellen-Leitung (22), die elektrisch mit einer zweiten Elektrode des Lumineszenz-Elementes (15) verbunden ist;
eine dritte Stromquellen-Leitung (20), die zum Zuführen einer ersten Bezugsspannung eingerichtet ist, die einen Spannungswert einer zweiten Elektrode (132) des ersten Kondensators (13) bestimmt;
eine vierte Stromquellen-Leitung (20), die elektrisch mit einer zweiten Elektrode des zweiten Kondensators (51) verbunden ist, wobei die vierte Stromquellen-Leitung (20) zum Zuführen einer zweiten Bezugsspannung eingerichtet ist, die einen Spannungswert der zweiten Elektrode des zweiten Kondensators (41) bestimmt;
einen ersten Schalter (32) der zum Einstellen der ersten Bezugsspannung der zweiten Elektrode (132) des ersten Kondensators (13) eingerichtet ist;
einen zweiten Schalter (31), der so eingerichtet ist, dass er die Datenleitung (16) und die erste Elektrode (131) des ersten Kondensators (13) verbindet, um der ersten Elektrode des ersten Kondensators (13) die Signalspannung zuzuführen; sowie einen dritten Schalter (19), der zum Verbinden der ersten Elektrode des Lumineszenz-Elementes (15) und der zweiten Elektrode (132) des ersten Kondensators (13) eingerichtet ist;
wobei die Bildanzeigevorrichtung des Weiteren eine erste Zeilenleitung (17A) umfasst, die mit den Steuereingängen der ersten Schalter (12A) einer ersten Reihe von Pixel-Einheiten (10A) und den Steuereingängen der zweiten Schalter (11A) der ersten Reihe von Pixel-Einheiten (10A) verbunden ist, sowie eine zweite Zeilenleitung (17B) umfasst, die mit den Steuereingängen der ersten Schalter (12B) einer zweiten Reihe von Pixel-Einheiten (10B), die an die erste Reihe von Pixel-Einheiten (10B) angrenzt, mit den Steuereingängen der zweiten Schalter (11 B) der zweiten Reihe von Pixel-Einheiten (10B) und den Steuereingängen der dritten Schalter (19A) der ersten Reihe von Pixel-Einheiten (10A) verbunden ist,
wobei die Zeilenleitungs-Treiberschaltung (4) mit den Zeilenleitungen (17A, 17B) verbunden und zum Ändern eines Spannungspegels der Zeilenleitungen (17A, 17B) eingerichtet ist, und die Bildanzeigevorrichtung so eingerichtet ist, dass sie die Spaltenleitungs-Treiberschaltung (5) sowie die Zeilenleitungs-Treiberschaltung (4) so steuert, dass die folgenden Schritte durchgeführt werden:

Halten des Spannungspegels der ersten Zeilenleitung (17A) und der zweiten Zeilenleitung (17B) auf einem AUS-Pegel, um so die ersten, die zweiten und die dritten Schalter (32A, 31A, 19A) der ersten Reihe von Pixel-Einheiten (10A) zu öffnen, anschließend Ändern eines Spannungspegels der ersten Zeilenleitung (17A) auf einen AN-Pegel (t30), um die ersten und die zweiten Schalter (32A, 31A) der ersten Reihe von Pixel-Einheiten (10A) zu schließen, während gleichzeitig eine Signalspannung von der Datenleitung (16) angelegt wird, und damit ein Potenzial, das der Signalspannung entspricht, in den ersten Kondensator (13A) einer Pixel-Einheit der ersten Reihe von Pixel-Einheiten (10A) zu schreiben und dabei die zweite Zeilenleitung (17B) auf dem AUS-Pegel zu halten, anschließend
Ändern des Spannungspegels der ersten Zeilenleitung (17A) auf den AUS-Pegel (t31), um die ersten und die zweiten Schalter (32A, 31A) der ersten Reihe von Pixel-Einheiten (10A) auszuschalten, nachdem das der Signalspannung entsprechende Potenzial in den ersten Kondensator (13A) der Pixel-Einheit der ersten Reihe von Pixel-Einheiten (10A) geschrieben worden ist, während gleichzeitig die zweite Zeilenleitung (17B) auf dem AUS-Pegel gehalten wird, anschließend
Ändern eines Spannungspegels der zweiten Zeilenleitung auf den AN-Pegel (t31'), um die dritten Schalter (19A) der ersten Reihe von Pixel-Einheiten (10A) zu schließen und zuzulassen, dass ein Drain-Strom, der der Spannung entspricht, die von dem ersten Kondensator (13A) der Pixel-Einheit der ersten Reihe von Pixel-Einheiten (10A) gespeichert wird, durch sein Lumineszenz-Element (15A) fließt, und die ersten und die zweiten Schalter (32B, 31 B) der zweiten Reihe von Pixel-Einheiten (10B) zu schließen, während gleichzeitig eine Signalspannung von der Datenleitung (16) angelegt wird, und damit ein Potenzial, das der Signalspannung entspricht, in den ersten Kondensator (13B) einer Pixel-Einheit der zweiten Reihe von Pixel-Einheiten (10B) zu

schreiben, während gleichzeitig die erste Zeilenleitung (17A) auf dem AUS-Pegel gehalten wird.

3. Bildanzeigevorrichtung nach Anspruch 1 oder 2, wobei die erste Elektrode des Lumineszenz-Elementes (15) eine Anoden-Elektrode ist und die zweite Elektrode des Lumineszenz-Elementes (15) eine Kathoden-Elektrode ist, und
eine Spannung der ersten Stromquellen-Leitung (21) höher ist als eine Spannung der zweiten Stromquellen-Leitung (22), und ein Strom von der ersten Stromquellen-Leitung (21) zu der zweiten Stromquellen-Leitung (22) fließt.

4. Bildanzeigevorrichtung nach einem der vorangehenden Ansprüche 1 bis 3, wobei der zweite Kondensator (41; 51) so eingerichtet ist, dass er ein Source-Potenzial des Treibertransistors (14) speichert, während sich der dritte Schalter (19) in einem AUS-Zustand befindet, so dass ein Strom, der durch das Lumineszenz-Element (15) fließt, unabhängig davon stabilisiert wird, ob sich der dritte Schalter (19) in einem AN-Zustand oder in einem AUS-Zustand befindet.

5. Bildanzeigevorrichtung nach Anspruch 1 oder 2, wobei die dritte Stromquellen-Leitung (20) und die vierte Stromquellen-Leitung (20) als eine gemeinsame Stromquellen-Leitung eingerichtet sind.

6. Bildanzeigevorrichtung nach einem der Ansprüche 1 bis 5, wobei das Lumineszenz-Element (15) ein organisches Elektrolumineszenz-Element ist.

7. Verfahren zum Steuern einer Bildanzeigevorrichtung mit einer Vielzahl von Pixel-Einheiten (10), eine Datenleitung (16), einer Spaltenleitungs-Treiberschaltung (5), die mit der Datenleitung (16) verbunden und zum Ausgeben einer Signalspannung auf Basis eines Video-Signals eingerichtet ist, sowie einer Zeilenleitungs-Treiberschaltung (4), wobei jede Pixel-Einheit (10) umfasst:

ein Lumineszenz-Element (15);
einen ersten Kondensator (13);
einen Treibertransistor (14), der eine Gate-Elektrode, die mit einer ersten Elektrode (131) des ersten Kondensators (13) verbunden ist, sowie eine Source-Elektrode hat, die mit einer ersten Elektrode des Lumineszenz-Elementes (15) verbunden ist, und der so eingerichtet ist, dass er das Lumineszenz-Element (15) veranlasst, Licht zu emittieren, indem er einen Drain-Strom, der einer von dem ersten Kondensator (13) gespeicherten Spannung entspricht, an das Lumineszenz-Element (15) anlegt;
einen zweiten Kondensator (41), der eine erste Elektrode hat, die mit einer zweiten Elektrode (132) des ersten Kondensators (13) verbunden ist;
eine erste Stromquellen-Leitung (21), die elektrisch mit der Drain-Elektrode des Treibertransistors (14) verbunden ist;
eine zweite Stromquellen-Leitung (22), die elektrisch mit der zweiten Elektrode des Lumineszenz-Elementes (15) verbunden ist;
eine dritte Stromquellen-Leitung (20), die zum Zuführen einer ersten Bezugsspannung eingerichtet ist, die einen Spannungswert einer ersten Elektrode (131) des ersten Kondensators (13) bestimmt;
eine vierte Stromquellen-Leitung (20), die elektrisch mit einer zweiten Elektrode des zweiten Kondensators (41) verbunden ist, wobei die vierte Stromquellen-Leitung (20) zum Zuführen einer zweiten Bezugsspannung eingerichtet ist, die einen Spannungswert der zweiten Elektrode des zweiten Kondensators (41) bestimmt;
einen ersten Schalter (12), der zum Einstellen der Bezugsspannung der ersten Elektrode (131) des ersten Kondensators (13) eingerichtet ist;
einen zweiten Schalter (11), der so eingerichtet ist, dass er die Datenleitung (16) und die zweite Elektrode (132) des ersten Kondensators (13) verbindet, um der zweiten Elektrode (132) des ersten Kondensators (13) die Signalspannung zuzuführen; sowie
einen dritten Schalter (19), der zum Verbinden der ersten Elektrode des Lumineszenz-Elementes (15) und der zweiten Elektrode (132) des ersten Kondensators (13) eingerichtet ist;
wobei die Bildanzeigevorrichtung des Weiteren eine erste Zeilenleitung (17A) umfasst, die mit den Steuereingängen der ersten Schalter (12A) einer ersten Reihe von Pixel-Einheiten (10A) und den Steuereingängen der zweiten Schalter (11A) der ersten Reihe von Pixel-Einheiten (10A) verbunden ist, sowie eine zweite Zeilenleitung (17B) umfasst,
die mit den Steuereingängen der ersten Schalter (12B) einer zweiten Reihe von Pixel-Einheiten (10B), die an die erste Reihe von Pixel-Einheiten (10A) angrenzt, mit den Steuereingängen der zweiten Schalter (11 B) der zweiten Reihe von Pixel-Einheiten (10B) und den Steuereingängen der dritten Schalter (19A) der ersten Reihe von Pixel-Einheiten (10A) verbunden ist, wobei die Zeilenleitungs-Treiberschaltung (4) mit den Zeilenleitungen (17A, 17B) verbunden und zum Ändern eines Spannungspegels der Zeilenleitungen (17A, 17B) eingerichtet ist, und das Verfahren umfasst:

Halten des Spannungspegels der ersten Zeilenleitung (17A) und der zweiten Zeilen-

leitung (17B) auf einem AUS-Pegel, um so die ersten, die zweiten und die dritten Schalter (32A, 31A, 19A) der ersten Reihe von Pixel-Einheiten (10A) zu öffnen, anschließend
Ändern eines Spannungspegels der ersten Zeilenleitung (17A) auf einen AN-Pegel (t30), um die ersten und die zweiten Schalter (32A, 31A) der ersten Reihe von Pixel-Einheiten (10A) zu schließen, während gleichzeitig eine Signalspannung von der Datenleitung (16) angelegt wird, und damit ein Potenzial, das der Signalspannung entspricht, in den ersten Kondensator (13A) einer Pixel-Einheit der ersten Reihe von Pixel-Einheiten (10A) zu schreiben und dabei die zweite Zeilenleitung (17B) auf dem AUS-Pegel zu halten, anschließend
Ändern des Spannungspegels der ersten Zeilenleitung (17A) auf den AUS-Pegel (t31), um die ersten und die zweiten Schalter (32A, 31A) der ersten Reihe von Pixel-Einheiten (10A) auszuschalten, nachdem das der Signalspannung entsprechende Potenzial in den ersten Kondensator (13A) der Pixel-Einheit der ersten Reihe von Pixel-Einheiten (10A) geschrieben worden ist, während gleichzeitig die zweite Zeilenleitung (17B) auf dem AUS-Pegel gehalten wird, anschließend
Ändern eines Spannungspegels der zweiten Zeilenleitung auf den AN-Pegel (t31'), um die dritten Schalter (19A) der ersten Reihe von Pixel-Einheiten (10A) zu schließen und zuzulassen, dass ein Drain-Strom, der der Spannung entspricht, die von dem ersten Kondensator (13A) der Pixel-Einheit der ersten Reihe von Pixel-Einheiten (10A) gespeichert wird, durch sein Lumineszenz-Element (15A) fließt, und die ersten und die zweiten Schalter (32B, 31 B) der zweiten Reihe von Pixel-Einheiten (10B) zu schließen, während gleichzeitig eine Signalspannung von der Datenleitung (16) angelegt wird, und damit ein Potenzial, das der Signalspannung entspricht, in den ersten Kondensator (13B) einer Pixel-Einheit der zweiten Reihe von Pixel-Einheiten (10B) zu schreiben, während gleichzeitig die erste Zeilenleitung (17A) auf dem AUS-Pegel gehalten wird.

8. Verfahren zum Steuern einer Bildanzeigevorrichtung mit einer Vielzahl von Pixel-Einheiten (10), eine Datenleitung (16), einer Spaltenleitungs-Treiberschaltung (5), die mit der Datenleitung (16) verbunden und zum Ausgeben einer Signalspannung auf Basis eines Video-Signals eingerichtet ist, sowie einer Zeilenleitungs-Treiberschaltung (4), wobei jede Pixel-Einheit (10) umfasst:

ein Lumineszenz-Element (15);
einen ersten Kondensator (13);
einen Treibertransistor (14), der eine Gate-Elektrode, die mit einer ersten Elektrode (131) des ersten Kondensators (13) verbunden ist, sowie eine Source-Elektrode hat, die mit einer ersten Elektrode des Lumineszenz-Elementes (15) verbunden ist, und der so eingerichtet ist, dass er das Lumineszenz-Element (15) veranlasst, Licht zu emittieren, indem er einen Drain-Strom, der einer von dem ersten Kondensator (13) gespeicherten Spannung entspricht, an das Lumineszenz-Element (15) anlegt;
einen zweiten Kondensator (51), der eine erste Elektrode hat, die mit einer zweiten Elektrode (132) des ersten Kondensators (13) verbunden ist;
eine erste Stromquellen-Leitung (21), die elektrisch mit der Drain-Elektrode des Treibertransistors (14) verbunden ist;
eine zweite Stromquellen-Leitung (22), die elektrisch mit der zweiten Elektrode des Lumineszenz-Elementes (15) verbunden ist;
eine dritte Stromquellen-Leitung (20), die zum Zuführen einer ersten Bezugsspannung eingerichtet ist, die einen Spannungswert einer zweiten Elektrode (132) des ersten Kondensators (13) bestimmt;
eine vierte Stromquellen-Leitung, die elektrisch mit der zweiten Elektrode des zweiten Kondensators (51) verbunden ist, wobei die vierte Stromquellen-Leitung zum Zuführen einer zweiten Bezugsspannung eingerichtet ist, die einen Spannungswert einer zweiten Elektrode des zweiten Kondensators (51) bestimmt;
einen ersten Schalter (32), der zum Einstellen der Bezugsspannung der zweiten Elektrode des ersten Kondensators (13) eingerichtet ist;
einen zweiten Schalter (32), der so eingerichtet ist, dass er die Datenleitung (16) und die erste Elektrode (131) des ersten Kondensators (13) verbindet, um der ersten Elektrode des ersten Kondensators (13) die Signalspannung zuzuführen; sowie
einen dritten Schalter (19), der zum Verbinden der ersten Elektrode des Lumineszenz-Elementes (15) und der zweiten Elektrode (132) des ersten Kondensators (13) eingerichtet ist;
wobei die Bildanzeigevorrichtung des Weiteren eine erste Zeilenleitung (17A) umfasst, die mit den Steuereingängen der ersten Schalter (12A) einer ersten Reihe von Pixel-Einheiten (10A) und den Steuereingängen der zweiten Schalter (11A) der ersten Reihe von Pixel-Einheiten (10A) verbunden ist, sowie eine zweite Zeilen-

leitung (17B) umfasst, die mit den Steuereingängen der ersten Schalter (12B) einer zweiten Reihe von Pixel-Einheiten (10B), die an die erste Reihe von Pixel-Einheiten (10A) angrenzt, mit den Steuereingängen der zweiten Schalter (11 B) der zweiten Reihe von Pixel-Einheiten (10B) und den Steuereingängen der dritten Schalter (19A) der ersten Reihe von Pixel-Einheiten (10A) verbunden ist,
wobei die Zeilenleitungs-Treiberschaltung (4) mit den Zeilenleitungen (17A, 17B) verbunden und zum Ändern eines Spannungspegels der Zeilenleitungen (17A, 17B) eingerichtet ist, und das Verfahren umfasst:

Halten des Spannungspegels der ersten Zeilenleitung (17A) und der zweiten Zeilenleitung (17B) auf einem AUS-Pegel, um so die ersten, die zweiten und die dritten Schalter (32A, 31A, 19A) der ersten Reihe von Pixel-Einheiten (10A) zu öffnen, anschließend
Ändern eines Spannungspegels der ersten Zeilenleitung (17A) auf einen AN-Pegel (t30), um die ersten und die zweiten Schalter (32A, 31A) der ersten Reihe von Pixel-Einheiten (10A) zu schließen, während gleichzeitig eine Signalspannung von der Datenleitung (16) angelegt wird, und damit ein Potenzial, das der Signalspannung entspricht, in den ersten Kondensator (13A) einer Pixel-Einheit der ersten Reihe von Pixel-Einheiten (10A) zu schreiben und dabei die zweite Zeilenleitung (17B) auf dem AUS-Pegel zu halten, anschließend
Ändern des Spannungspegels der ersten Zeilenleitung (17A) auf den AUS-Pegel (t31), um die ersten und die zweiten Schalter (32A, 31A) der ersten Reihe von Pixel-Einheiten (10A) auszuschalten, nachdem das der Signalspannung entsprechende Potenzial in den ersten Kondensator (13A) der Pixel-Einheit der ersten Reihe von Pixel-Einheiten (10A) geschrieben worden ist, während gleichzeitig die zweite Zeilenleitung (17B) auf dem AUS-Pegel gehalten wird, anschließend
Ändern eines Spannungspegels der zweiten Zeilenleitung auf den AN-Pegel (t31'), um die dritten Schalter (19A) der ersten Reihe von Pixel-Einheiten (10A) zu schließen und zuzulassen, dass ein Drain-Strom, der der Spannung entspricht, die von dem ersten Kondensator (13A) der Pixel-Einheit der ersten Reihe von Pixel-Einheiten (10A) gespeichert wird, durch sein Lumineszenz-Element (15A) fließt, und die ersten und die zweiten Schalter (32B, 31 B) der zweiten Reihe von Pixel-Einheiten (10B) zu schließen, während gleichzeitig eine Signalspannung von der Datenleitung (16) angelegt wird, und damit ein Potenzial, das der Signalspannung entspricht, in den ersten Kondensator (13B) einer Pixel-Einheit der zweiten Reihe von Pixel-Einheiten (10B) zu schreiben, während gleichzeitig die erste Zeilenleitung (17A) auf dem AUS-Pegel gehalten wird.

Revendications

1. Dispositif d'affichage d'image comprenant une pluralité d'unités de pixels (10), une ligne de données (16), un circuit d'activation de ligne de signal (5) connecté à la ligne de données (16) et adapté à fournir en sortie une tension de signal basée sur un signal vidéo et un circuit d'activation de ligne de balayage (4), chaque unité de pixel (10) comprenant :

un élément de luminescence (15) ;
un premier condensateur (13) ;
un transistor d'activation (14) ayant une électrode de grille connectée à une première électrode (131) dudit premier condensateur (13) et une électrode de source connectée à une première électrode dudit élément de luminescence (15), et adapté à faire émettre de la lumière par ledit élément de luminescence (15) en appliquant audit élément de luminescence (15) un courant de drain correspondant à une tension maintenue par ledit premier condensateur (13), ;
un second condensateur (41) ayant une première électrode connectée à la seconde électrode (132) dudit premier condensateur (13) ;
une première ligne de source d'alimentation (21) connectée électriquement à ladite électrode de drain dudit transistor d'activation (14) ;
une deuxième ligne de source d'alimentation (22) connectée électriquement à la seconde électrode dudit élément de luminescence (15) ;
une troisième ligne de source d'alimentation (20) adaptée à fournir une première tension de référence définissant une valeur de tension de la première électrode (131) dudit premier condensateur (13) ;
une quatrième ligne de source d'alimentation (20) connectée électriquement à la seconde électrode dudit second condensateur (41), la quatrième ligne de source d'alimentation (20) étant adaptée à fournir une seconde tension de référence définissant une valeur de tension de ladite seconde électrode dudit second condensateur (41) ;
un premier commutateur (12) adapté à fixer la première tension de référence de ladite premiè-

re électrode (131) dudit premier condensateur (13) ;
un deuxième commutateur (11) adapté à connecter ladite ligne de données (16) et ladite seconde électrode (132) dudit premier condensateur (13) pour fournir la tension de signal à la seconde électrode (132) du premier condensateur (13) ; et
un troisième commutateur (19) adapté à connecter ladite première électrode dudit élément de luminescence (15) et ladite seconde électrode (132) dudit premier condensateur (13) ;
le dispositif d'affichage d'image comprenant en outre une première ligne de balayage (17A) connectée aux entrées de commande des premiers commutateurs (12A) d'une première rangée d'unités de pixels (10A), aux entrées de commande des deuxièmes commutateurs (11A) de la première rangée d'unités de pixels (10A), et une seconde ligne de balayage (17B) connectée aux entrées de commande des premiers commutateurs (12B) d'une deuxième rangée d'unités de pixels (10B) adjacente à la première rangée d'unités de pixels (10A), aux entrées de commande des deuxièmes commutateurs (11B) de la deuxième rangée d'unités de pixels (10B) et aux entrées de commande des troisièmes commutateurs (19A) de la première rangée d'unités de pixels (10A),
dans lequel le circuit d'activation de ligne de balayage (4) est connecté aux lignes de balayage (17A, 17B) et est adapté à modifier le niveau de tension des lignes de balayage (17A, 17B), et
le dispositif d'affichage d'image est adapté à commander le circuit d'activation de ligne de signal (5) et le circuit d'activation de ligne de balayage (4) de façon à exécuter les étapes suivantes :

maintien du niveau de tension de la première ligne de balayage (17A) et de la seconde ligne de balayage (17B) à un niveau non passant de façon à désactiver les premier, deuxième et troisième commutateurs (12A, 11A, 19A) de la première rangée d'unités de pixels (10A), puis
modification du niveau de tension de la première ligne de balayage (17A) à un niveau passant (t30) de façon à activer les premier et deuxième commutateurs (12A, 11A) de la première rangée d'unités de pixels (10A), tandis qu'une tension de signal est appliquée depuis la ligne de données (16) de façon à écrire un potentiel correspondant à la tension de signal dans le premier condensateur (13A) d'une unité de pixel de la première rangée d'unités de pixels (10A) tout en maintenant la seconde ligne de balayage (17B) au niveau non passant, puis
modification du niveau de tension de la première ligne de balayage (17A) à un niveau non passant (t31) pour désactiver le premier et le deuxième commutateur (12A, 11A) de la première rangée d'unités de pixels (10A) après avoir écrit le potentiel correspondant à la tension de signal dans le premier condensateur (13A) de l'unité de pixel de la première rangée d'unités de pixels (10A) tout en maintenant la seconde ligne de balayage (17B) au niveau non passant, puis
modification du niveau de tension de la seconde ligne de balayage (17B) au niveau passant (t31') pour activer les troisièmes commutateurs (19A) de la première rangée d'unités de pixels (10A) pour permettre la circulation d'un courant de drain correspondant à la tension maintenue par le premier condensateur (13A) de l'unité de pixel de la première rangée d'unités de pixels (10A), à travers son élément luminescent (15A) et pour activer les premier et deuxième commutateurs (12B, 11B) de la deuxième rangée d'unités de pixels (10B), tandis qu'une tension de signal est appliquée depuis la ligne de données (16) de façon à écrire un potentiel correspondant à la tension de signal dans le premier condensateur (13B) d'une unité de pixel de la deuxième rangée d'unités de pixels (10B) tout en maintenant la première ligne de balayage (17A) au niveau non passant.

2. Dispositif d'affichage d'image comprenant une pluralité d'unités de pixels (10), une ligne de données (16), un circuit d'activation de ligne de signal (5) connecté à la ligne de données (16) et adapté à fournir en sortie une tension de signal basée sur un signal vidéo et un circuit d'activation de ligne de balayage (4), chaque unité de pixel comprenant :

un élément de luminescence (15) ;
un premier condensateur (13) ;
un transistor d'activation (14) ayant une électrode de grille connectée à une première électrode (131) dudit premier condensateur (13) et une électrode de source connectée à une première électrode dudit élément de luminescence (15), et adapté à faire émettre de la lumière par ledit élément de luminescence (15) en appliquant audit élément de luminescence un courant de drain correspondant à une tension maintenue par ledit premier condensateur (13) ;
un second condensateur (51) ayant une première électrode connectée à la seconde électrode (132) dudit premier condensateur (13) ;

une première ligne de source d'alimentation (21) connectée électriquement à ladite électrode de drain dudit transistor d'activation (14) ;
une deuxième ligne de source d'alimentation (22) connectée électriquement à la seconde électrode dudit élément de luminescence (15) ;
une troisième ligne de source d'alimentation (20) adaptée à fournir une première tension de référence définissant une valeur de tension de la seconde électrode (132) dudit premier condensateur (13) ;
une quatrième ligne de source d'alimentation connectée électriquement à la seconde électrode dudit second condensateur (51), ladite quatrième ligne de source d'alimentation étant adaptée à fournir une seconde tension de référence définissant une valeur de tension de ladite seconde électrode dudit second condensateur (51) ;
un premier commutateur (32) adapté à fixer la première tension de référence de ladite seconde électrode (132) dudit premier condensateur (13) ;
un deuxième commutateur (31) adapté à connecter ladite ligne de données (16) et ladite première électrode (131) dudit premier condensateur (13) pour fournir la tension de signal à la première électrode du premier condensateur (13) ; et
un troisième commutateur (19) adapté à connecter ladite première électrode dudit élément de luminescence (15) et ladite seconde électrode (132) dudit premier condensateur (13) ;
le dispositif d'affichage d'image comprenant en outre une première ligne de balayage (17A) connectée aux entrées de commande des premiers commutateurs (12A) d'une première rangée d'unités de pixels (10A), aux entrées de commande des deuxièmes commutateurs (11A) de la première rangée d'unités de pixels (10A), et une seconde ligne de balayage (17B) connectée aux entrées de commande des premiers commutateurs (12B) d'une deuxième rangée d'unités de pixels (10B) adjacente à la première rangée d'unités de pixels (10B), aux entrées de commande des deuxièmes commutateurs (11B) de la deuxième rangée d'unités de pixels (10B) et aux entrées de commande des troisièmes commutateurs (19A) de la première rangée d'unités de pixels (10A),
dans lequel le circuit d'activation de ligne de balayage (4) est connecté aux lignes de balayage (17A, 17B) et est adapté à modifier le niveau de tension des lignes de balayage (17A, 17B), et
le dispositif d'affichage d'image est adapté à commander le circuit d'activation de ligne de signal (5) et le circuit d'activation de ligne de balayage (4) de façon à exécuter les étapes suivantes :

maintien du niveau de tension de la première ligne de balayage (17A) et de la seconde ligne de balayage (17B) à un niveau non passant de façon à désactiver les premier, deuxième et troisième commutateurs (32A, 31A, 19A) de la première rangée d'unités de pixels (10A), puis
modification du niveau de tension de la première ligne de balayage (17A) à un niveau passant (t30) pour activer les premier et deuxième commutateurs (32A, 31A) de la première rangée d'unités de pixels (10A), tandis qu'une tension de signal est appliquée depuis la ligne de données (16) de façon à écrire un potentiel correspondant à la tension de signal dans le premier condensateur (13A) d'une unité de pixel de la première rangée d'unités de pixels (10A) tout en maintenant la seconde ligne de balayage (17B) au niveau non passant, puis
modification du niveau de tension de la première ligne de balayage (17A) au niveau non passant (t31) pour désactiver le premier et le deuxième commutateur (32A, 31A) de la première rangée d'unités de pixels (10A), après avoir écrit le potentiel correspondant à la tension de signal dans le premier condensateur (13A) de l'unité de pixel de la première rangée d'unités de pixels (10A) tout en maintenant la seconde ligne de balayage (17B) au niveau non passant, puis
modification du niveau de tension de la seconde ligne de balayage (17B) au niveau passant (t31') pour activer les troisièmes commutateurs (19A) de la première rangée d'unités de pixels (10A) pour permettre la circulation d'un courant de drain correspondant à la tension maintenue par le premier condensateur (13A) de l'unité de pixel de la première rangée d'unités de pixels (10A), à travers son élément luminescent (15A) et pour activer les premier et deuxième commutateurs (32B, 31B) de la deuxième rangée d'unités de pixels (10B), tandis qu'une tension de signal est appliquée depuis la ligne de données (16) de façon à écrire un potentiel correspondant à la tension de signal dans le premier condensateur (13B) d'une unité de pixel de la deuxième rangée d'unités de pixels (10B) tout en maintenant la première ligne de balayage (17A) au niveau non passant.

3. Dispositif d'affichage d'image selon la revendication 1 ou 2, dans lequel ladite première électrode dudit

première élément luminescent (15) est une électrode d'anode et ladite seconde électrode dudit élément luminescent (15) est une électrode de cathode, et la tension de ladite première ligne de source d'alimentation (21) est supérieure à la tension de ladite seconde ligne de source d'alimentation (22), et un courant circule de ladite première ligne de source d'alimentation (21) à ladite seconde ligne de source d'alimentation (22).

4. Dispositif d'affichage d'image selon l'une des revendications 1 à 3, dans lequel le second condensateur (41; 51) est adapté à stocker le potentiel de source du transistor d'activation (14), tandis que le troisième commutateur (19) et dans un état désactivé, de sorte qu'un courant traversant l'élément luminescent (15) est stabilisé indépendamment du fait que le troisième commutateur (19) est dans un état passant ou dans un état non passant.

5. Dispositif d'affichage d'image selon la revendication 1 ou 2, dans lequel ladite troisième ligne de source d'alimentation (20) et ladite quatrième ligne de source d'alimentation (20) sont prévues en tant que ligne de sources d'alimentation commune.

6. Dispositif d'affichage d'image selon l'une des revendications 1 à 5, dans lequel ledit élément de luminescence (15) est un élément électroluminescent (EL) organique.

7. Procédé de commande d'un dispositif d'affichage d'image avec une pluralité d'unités de pixels (10), une ligne de données (16), un circuit d'activation de ligne de signal (5) connecté à la ligne de données (16) et adapté à fournir en sortie une tension de signal basée sur un signal vidéo et un circuit d'activation de ligne de balayage (4), chaque unité de pixel (10) comprenant :

un élément de luminescence (15) ;
un premier condensateur (13) ;
un transistor d'activation (14) ayant une électrode de grille connectée à une première électrode (131) du premier condensateur (13) et une électrode de source connectée à une première électrode de l'élément de luminescence (15), et adapté à faire émettre de la lumière par l'élément de luminescence (15) en appliquant à l'élément de luminescence (15) un courant de drain correspondant à une tension maintenue par le premier condensateur (13) ;
un second condensateur (41) ayant une première électrode connectée à la seconde électrode (132) du premier condensateur (13) ;
une première ligne de source d'alimentation (21) connectée électriquement à l'électrode de drain du transistor d'activation (14) ;
une deuxième ligne de source d'alimentation (22) connectée électriquement à la seconde électrode de l'élément de luminescence (15) ;
une troisième ligne de source d'alimentation (20) adaptée à fournir une première tension de référence définissant une valeur de tension de la première électrode (131) du premier condensateur (13) ;
une quatrième ligne de source d'alimentation (20) connectée électriquement à la seconde électrode du second condensateur (41), la quatrième ligne de source d'alimentation (20) étant adaptée à fournir une seconde tension de référence définissant une valeur de tension de la seconde électrode du second condensateur (41) ;
un premier commutateur (12) adapté à fixer la tension de référence de la première électrode (131) du premier condensateur (13) ;
un deuxième commutateur (11) adapté à connecter ladite ligne de données (16) et la seconde électrode (132) du premier condensateur (13) pour fournir la tension de signal à la seconde électrode (132) du premier condensateur (13) ; et
un troisième commutateur (19) adapté à connecter la première électrode de l'élément de luminescence (15) et la seconde électrode (132) du premier condensateur (13) ;
le dispositif d'affichage d'image comprenant en outre une première ligne de balayage (17A) connectée aux entrées de commande des premiers commutateurs (12A) d'une première rangée d'unités de pixels (10A), aux entrées de commande des deuxièmes commutateurs (11A) de la première rangée d'unités de pixels (10A), et une seconde ligne de balayage (17B) connectée aux entrées de commande des premiers commutateurs (12B) d'une deuxième rangée d'unités de pixels (10B) adjacente à la première rangée d'unités de pixels (10A), aux entrées de commande des deuxièmes commutateurs (11B) de la deuxième rangée d'unités de pixels (10B) et aux entrées de commande des troisièmes commutateurs (19A) de la première rangée d'unités de pixels (10A),
dans lequel le circuit d'activation de ligne de balayage (4) est connecté aux lignes de balayage (17A, 17B) et est adapté à modifier le niveau de tension des lignes de balayage (17A, 17B),
ledit procédé comprenant
le maintien du niveau de tension de la première ligne de balayage (17A) et de la seconde ligne de balayage (17B) à un niveau non passant de façon à désactiver les premier, deuxième et troisième commutateurs (32A, 31A, 19A) de la première rangée d'unités de pixels (10A), puis
la modification du niveau de tension de la pre-

mière ligne de balayage (17A) à un niveau passant (t30), de façon à activer les premier et deuxième commutateurs (32A, 31A) de la première rangée d'unités de pixels (10A), tandis qu'une tension de signal est appliquée depuis la ligne de données (16) de façon à écrire un potentiel correspondant à la tension de signal dans le premier condensateur (13A) d'une unité de pixel de la première rangée d'unités de pixels (10A) tout en maintenant la seconde ligne de balayage (17B) au niveau non passant, puis

la modification du niveau de tension de la première ligne de balayage (17A) au niveau non passant (t31) pour désactiver le premier et le deuxième commutateur (32A, 31A) de la première rangée d'unités de pixels (10A) après avoir écrit le potentiel correspondant à la tension de signal dans le premier condensateur (13A) de l'unité de pixel de la première rangée d'unités de pixels (10A) tout en maintenant la seconde ligne de balayage (17B) au niveau non passant, puis

la modification du niveau de tension de la seconde ligne de balayage (17B) au niveau passant (t31') pour activer les troisièmes commutateurs (19A) de la première rangée d'unités de pixels (10A) pour permettre la circulation d'un courant de drain correspondant à la tension maintenue par le premier condensateur (13A) de l'unité de pixel de la première rangée d'unités de pixels (10A), à travers son élément luminescent (15A) et pour activer les premier et deuxième commutateurs (32B, 31B) de la deuxième rangée d'unités de pixels (10B), tandis qu'une tension de signal est appliquée depuis la ligne de données (16) de façon à écrire un potentiel correspondant à la tension de signal dans le premier condensateur (13B) d'une unité de pixel de la deuxième rangée d'unités de pixels (10B) tout en maintenant la première ligne de balayage (17A) au niveau non passant.

8. Procédé de commande d'un dispositif d'affichage d'image avec une pluralité d'unités de pixels (10), une ligne de données (16), un circuit d'activation de ligne de signal (5) connecté à la ligne de données (16) et adapté à fournir en sortie une tension de signal basée sur un signal vidéo et un circuit d'activation de ligne de balayage (4), chaque unité de pixel (10) comprenant :

un élément de luminescence (15) ;
un premier condensateur (13) ;
un transistor d'activation (14) ayant une électrode de grille connectée à une première électrode (131) du premier condensateur (13) et une électrode de source connectée à une première électrode de l'élément de luminescence (15), et adapté à faire émettre de la lumière par l'élément de luminescence (15) en appliquant à l'élément de luminescence (15) un courant de drain correspondant à une tension maintenue par le premier condensateur (13) ;
un second condensateur (51) ayant une première électrode connectée à la seconde électrode (132) du premier condensateur (13) ;
une première ligne de source d'alimentation (21) connectée électriquement à l'électrode de drain du transistor d'activation (14) ;
une deuxième ligne de source d'alimentation (22) connectée électriquement à la seconde électrode de l'élément de luminescence (15) ;
une troisième ligne de source d'alimentation (20) adaptée à fournir une première tension de référence définissant une valeur de tension de la seconde électrode (132) du premier condensateur (13) ;
une quatrième ligne de source d'alimentation connectée électriquement à ladite seconde électrode dudit second condensateur (51), ladite quatrième ligne de source d'alimentation étant adaptée à fournir une seconde tension de référence définissant une valeur de tension de la seconde électrode du second condensateur (51) ;
un premier commutateur (32) adapté à fixer la première tension de référence de la seconde électrode du premier condensateur (13) ;
un deuxième commutateur (31) adapté à connecter la ligne de données (16) et la première électrode (131) du premier condensateur (13) pour fournir la tension de signal à la deuxième première électrode du premier condensateur (13) ; et
un troisième commutateur (19) adapté à connecter la première électrode de l'élément de luminescence (15) et la seconde électrode (132) du premier condensateur (13) ;
le dispositif d'affichage d'image comprenant en outre une première ligne de balayage (17A) connectée aux entrées de commande des premiers commutateurs (12A) d'une première rangée d'unités de pixels (10A), aux entrées de commande des deuxièmes commutateurs (11A) de la première rangée d'unités de pixels (10A), et une seconde ligne de balayage (17B) connectée aux entrées de commande des premiers commutateurs (12B) d'une deuxième rangée d'unités de pixels (10B) adjacente à la première rangée d'unités de pixels (10A), aux entrées de commande des deuxièmes commutateurs (11B) de la deuxième rangée d'unités de pixels (10B) et aux entrées de commande des troisièmes commutateurs (19A) de la première rangée d'unités de pixels (10A),
dans lequel le circuit d'activation de ligne de ba-

layage (4) est connecté aux lignes de balayage (17A, 17B) et est adapté à modifier le niveau de tension des lignes de balayage (17A, 17B), ledit procédé comprenant

le maintien du niveau de tension de la première ligne de balayage (17A) et de la seconde ligne de balayage (17B) à un niveau non passant de façon à désactiver les premier, deuxième et troisième commutateurs (32A, 31A, 19A) de la première rangée d'unités de pixels (10A), puis

la modification du niveau de tension de la première ligne de balayage (17A) à un niveau passant (t30) pour activer les premier et deuxième commutateurs (32A, 31A) de la première rangée d'unités de pixels (10A), tandis qu'une tension de signal est appliquée depuis la ligne de données (16) de façon à écrire un potentiel correspondant à la tension de signal dans le premier condensateur (13A) d'une unité de pixel de la première rangée d'unités de pixels (10A) tout en maintenant la seconde ligne de balayage (17B) au niveau non passant, puis

la modification du niveau de tension de la première ligne de balayage (17A) au niveau non passant (t31) pour désactiver le premier et le deuxième commutateur (32A, 31A) de la première rangée d'unités de pixels (10A) après avoir écrit le potentiel correspondant à la tension de signal dans le premier condensateur (13A) de l'unité de pixel de la première rangée d'unités de pixels (10A) tout en maintenant la seconde ligne de balayage (17B) au niveau non passant, puis

la modification du niveau de tension de la seconde ligne de balayage (17B) au niveau passant (t31') pour activer les troisièmes commutateurs (19A) de la première rangée d'unités de pixels (10A) pour permettre la circulation d'un courant de drain correspondant à la tension maintenue par le premier condensateur (13A) de l'unité de pixel de la première rangée d'unités de pixels (10A), à travers son élément luminescent (15A) et pour activer les premier et deuxième commutateurs (32B, 31B) de la deuxième rangée d'unités de pixels (10B), tandis qu'une tension de signal est appliquée depuis la ligne de données (16) de façon à écrire un potentiel correspondant à la tension de signal dans le premier condensateur (13B) d'une unité de pixel de la deuxième rangée d'unités de pixels (10B) tout en maintenant la première ligne de balayage (17A) au niveau non passant.

FIG. 1

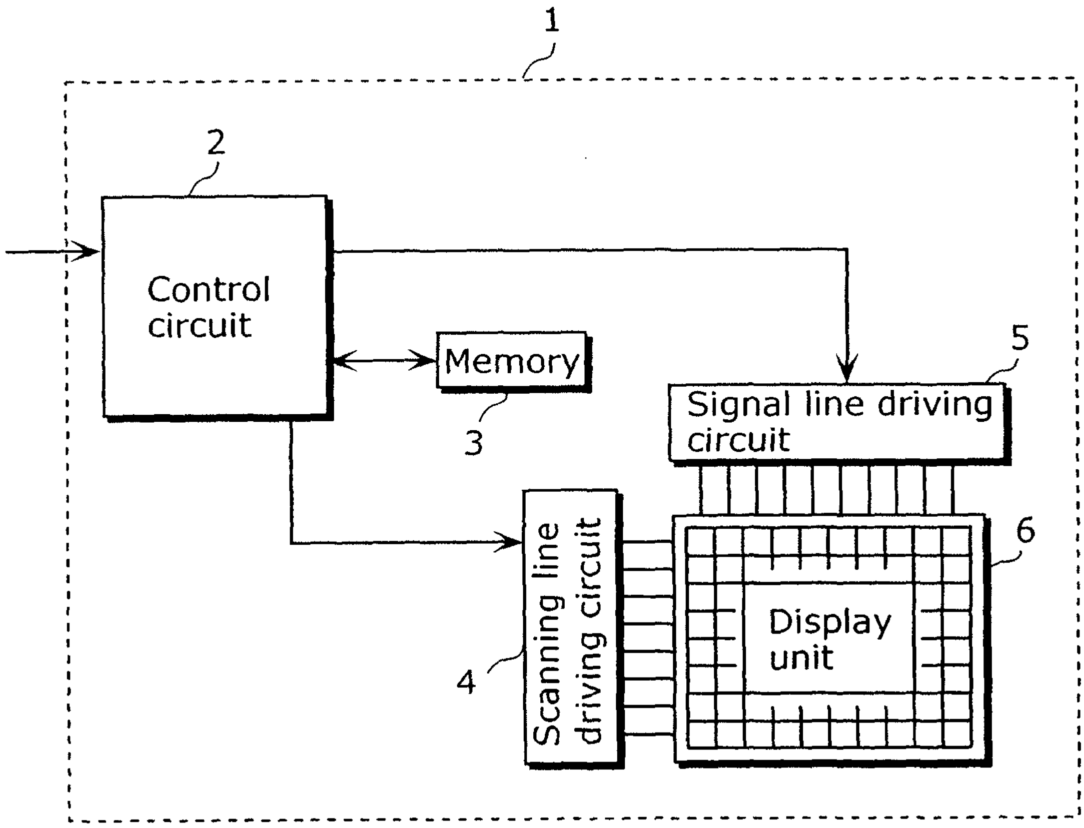

1
2
Control circuit
Memory
3
5
Signal line driving circuit
6
Scanning line driving circuit
4
Display unit

FIG. 2

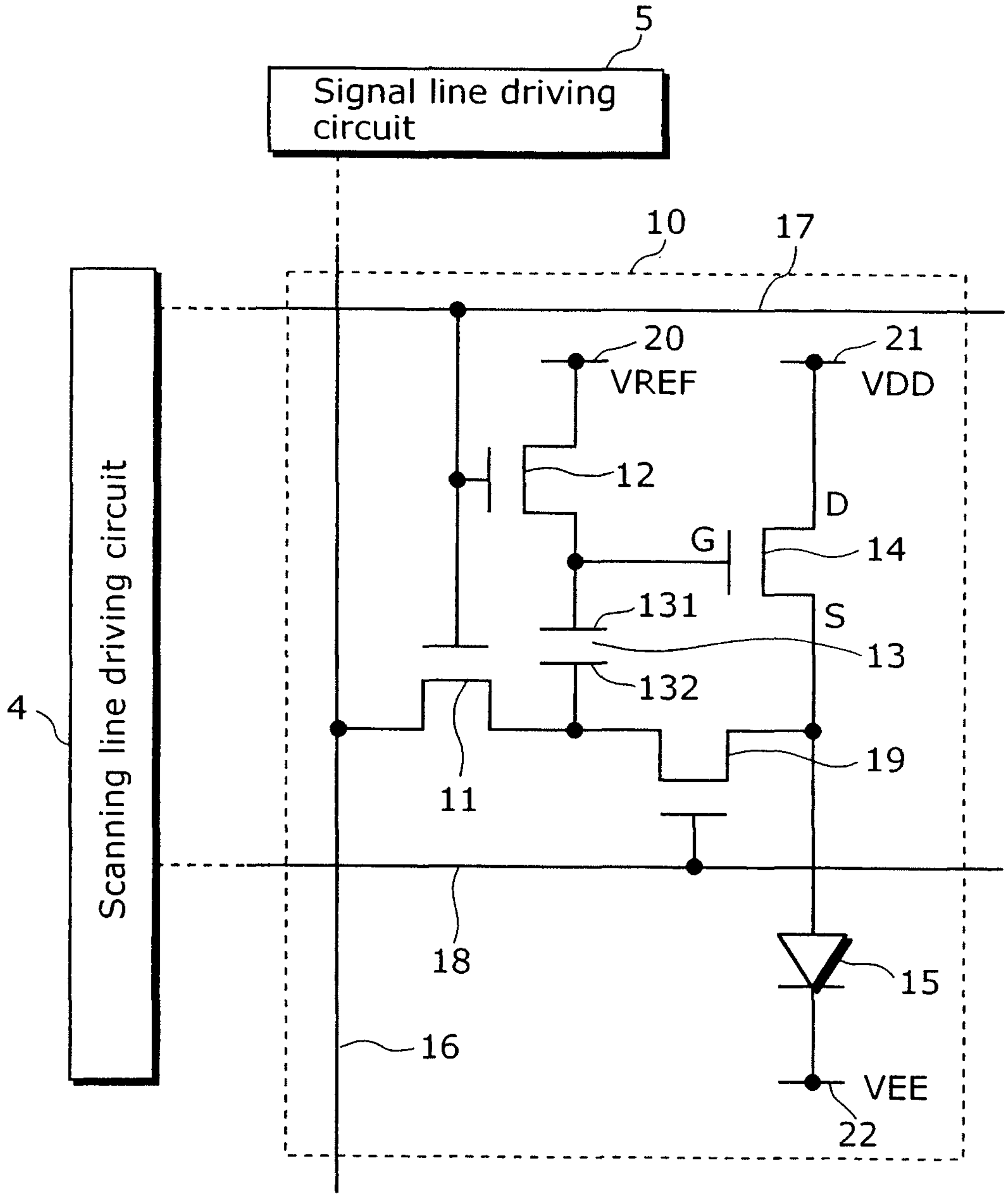

5
Signal line driving circuit
10
17
20
VREF
21
VDD
12
D
G
14
131
S
13
132
4
Scanning line driving circuit
11
19
18
15
16
VEE
22

FIG. 3A

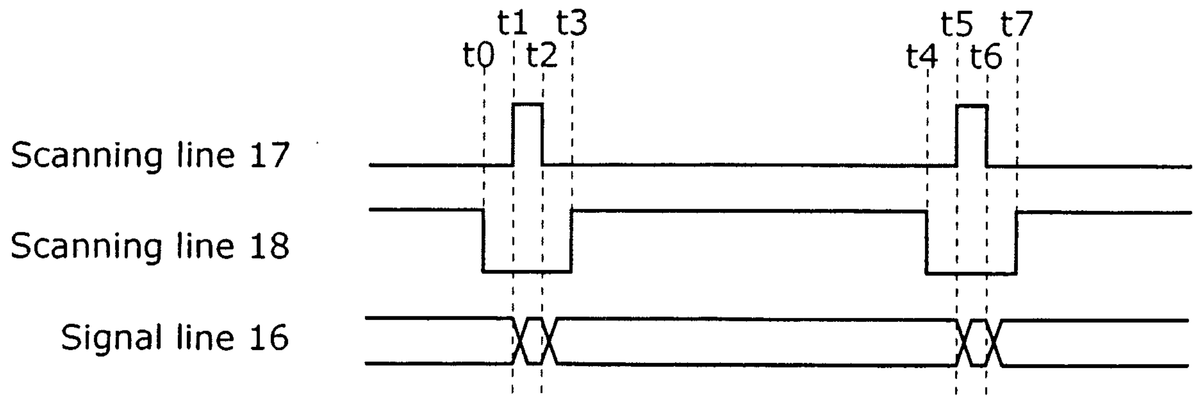

t0
t1
t2
t3
t4
t5
t6
t7
Scanning line 17
Scanning line 18
Signal line 16

FIG. 3B

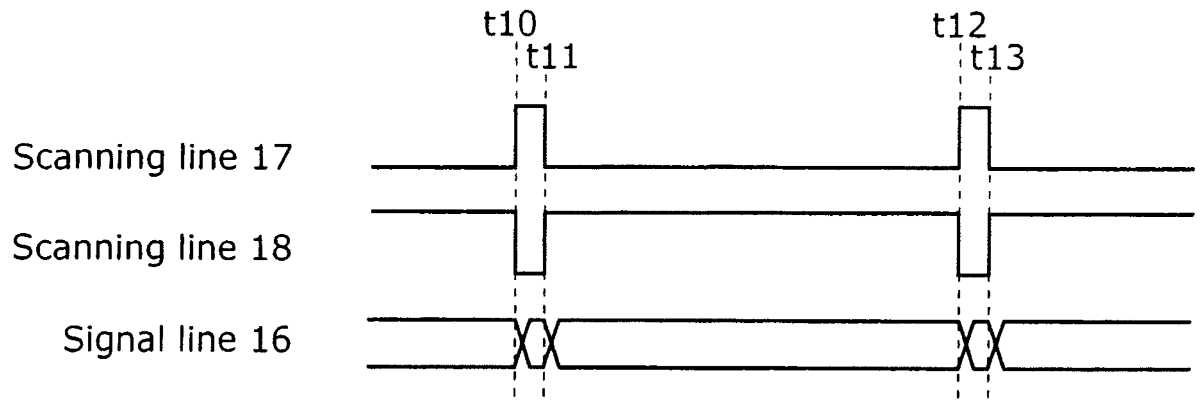

t10
t11
t12
t13
Scanning line 17
Scanning line 18
Signal line 16

FIG. 4

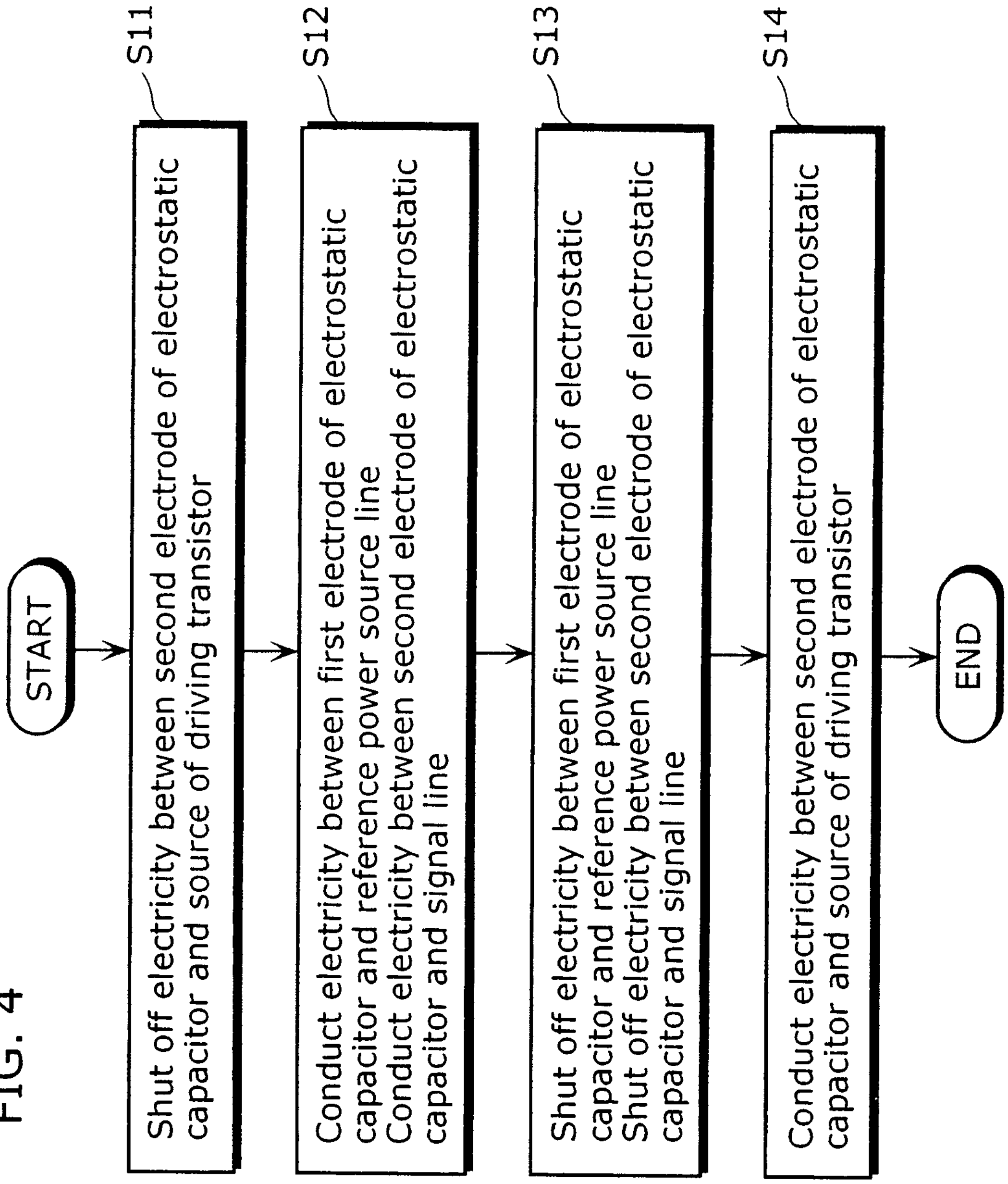

START
S11
Shut off electricity between second electrode of electrostatic capacitor and source of driving transistor
S12
Conduct electricity between first electrode of electrostatic capacitor and reference power source line
Conduct electricity between second electrode of electrostatic capacitor and signal line
S13
Shut off electricity between first electrode of electrostatic capacitor and reference power source line
Shut off electricity between second electrode of electrostatic capacitor and signal line
S14
Conduct electricity between second electrode of electrostatic capacitor and source of driving transistor
END

FIG. 5A

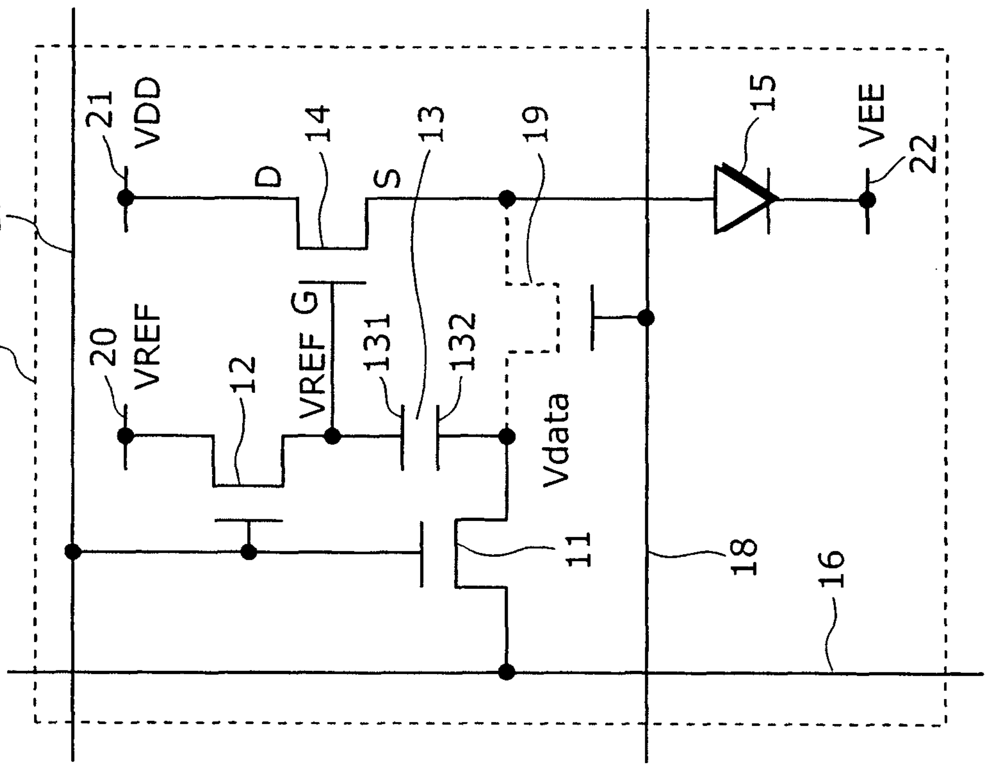

10
17
20
VREF
21
VDD
12
VREF
G
D
14
S
13
131
132
19
Vdata
11
18
16
15
VEE
22

FIG. 5B

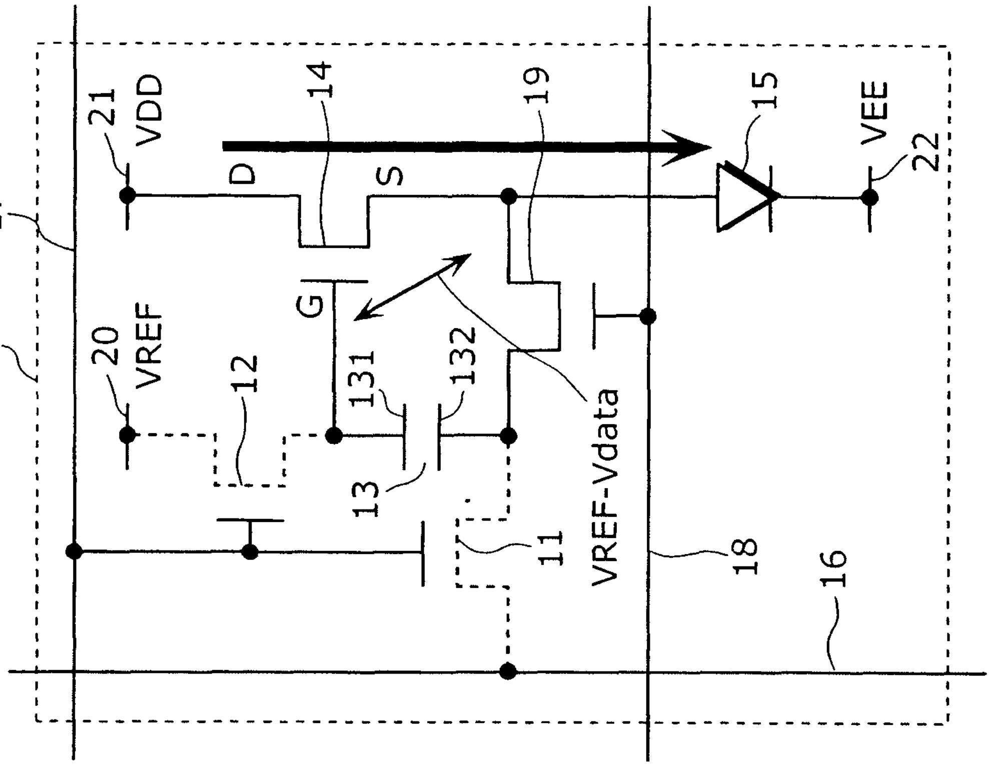

10
17
20
VREF
21
VDD
12
G
D
14
S
13
131
132
19
VREF-Vdata
11
18
16
15
VEE
22

FIG. 6

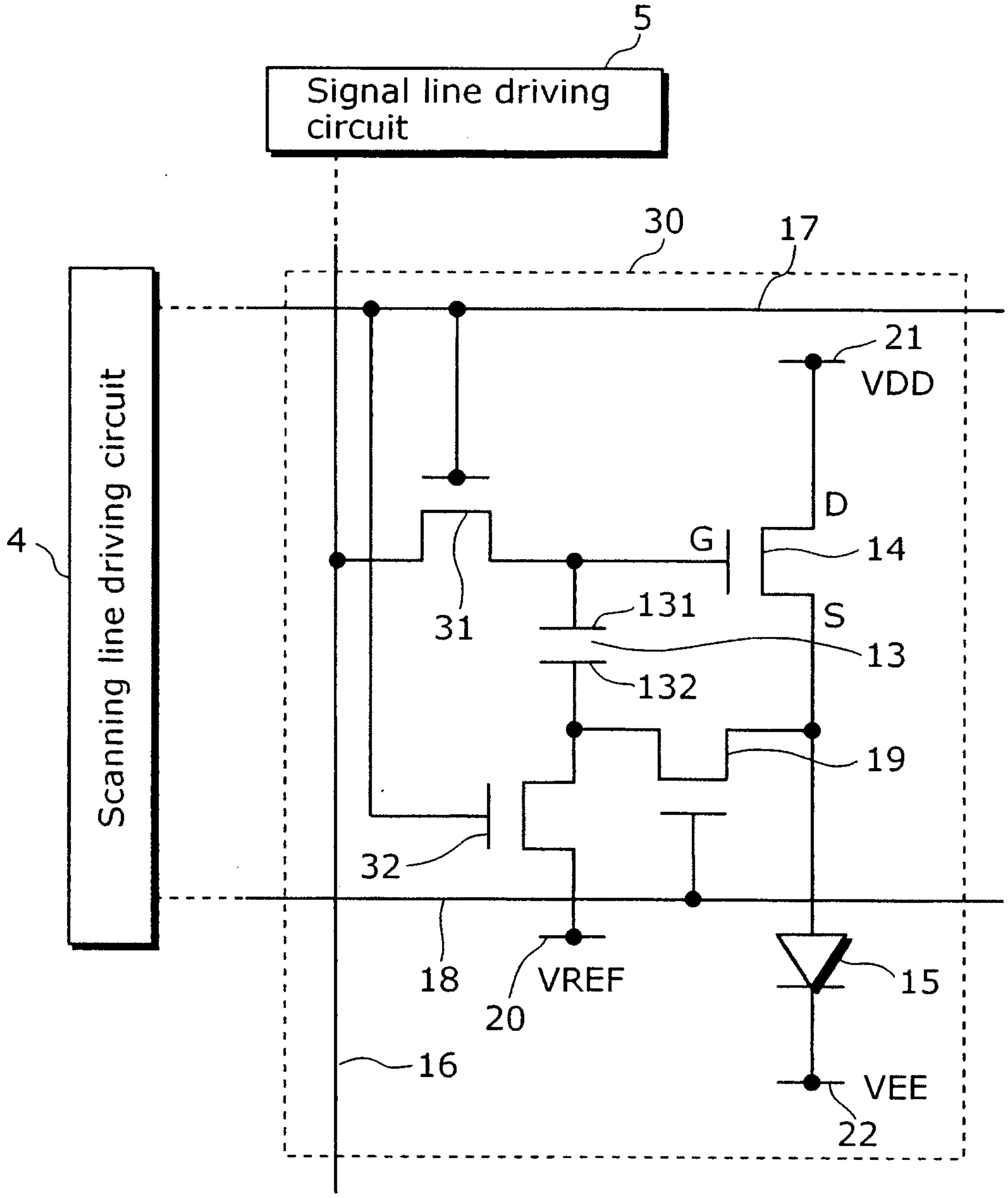

5
Signal line driving circuit
30
17
4
Scanning line driving circuit
21
VDD
D
G
14
31
131
S
13
132
19
32
18
20
VREF
15
16
VEE
22

FIG. 7

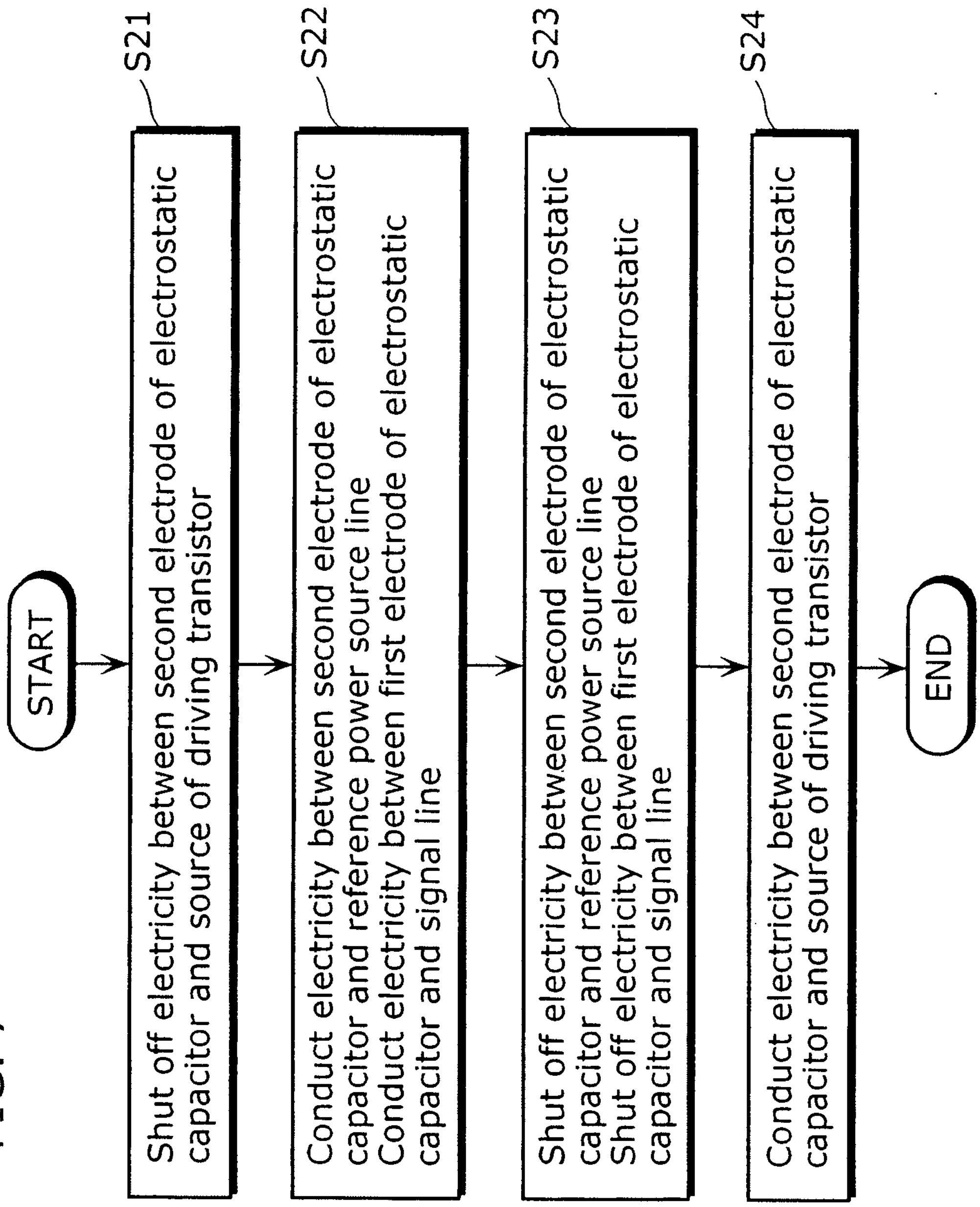

START
Shut off electricity between second electrode of electrostatic capacitor and source of driving transistor
S21
Conduct electricity between second electrode of electrostatic capacitor and reference power source line
Conduct electricity between first electrode of electrostatic capacitor and signal line
S22
Shut off electricity between second electrode of electrostatic capacitor and reference power source line
Shut off electricity between first electrode of electrostatic capacitor and signal line
S23
Conduct electricity between second electrode of electrostatic capacitor and source of driving transistor
S24
END

FIG. 8

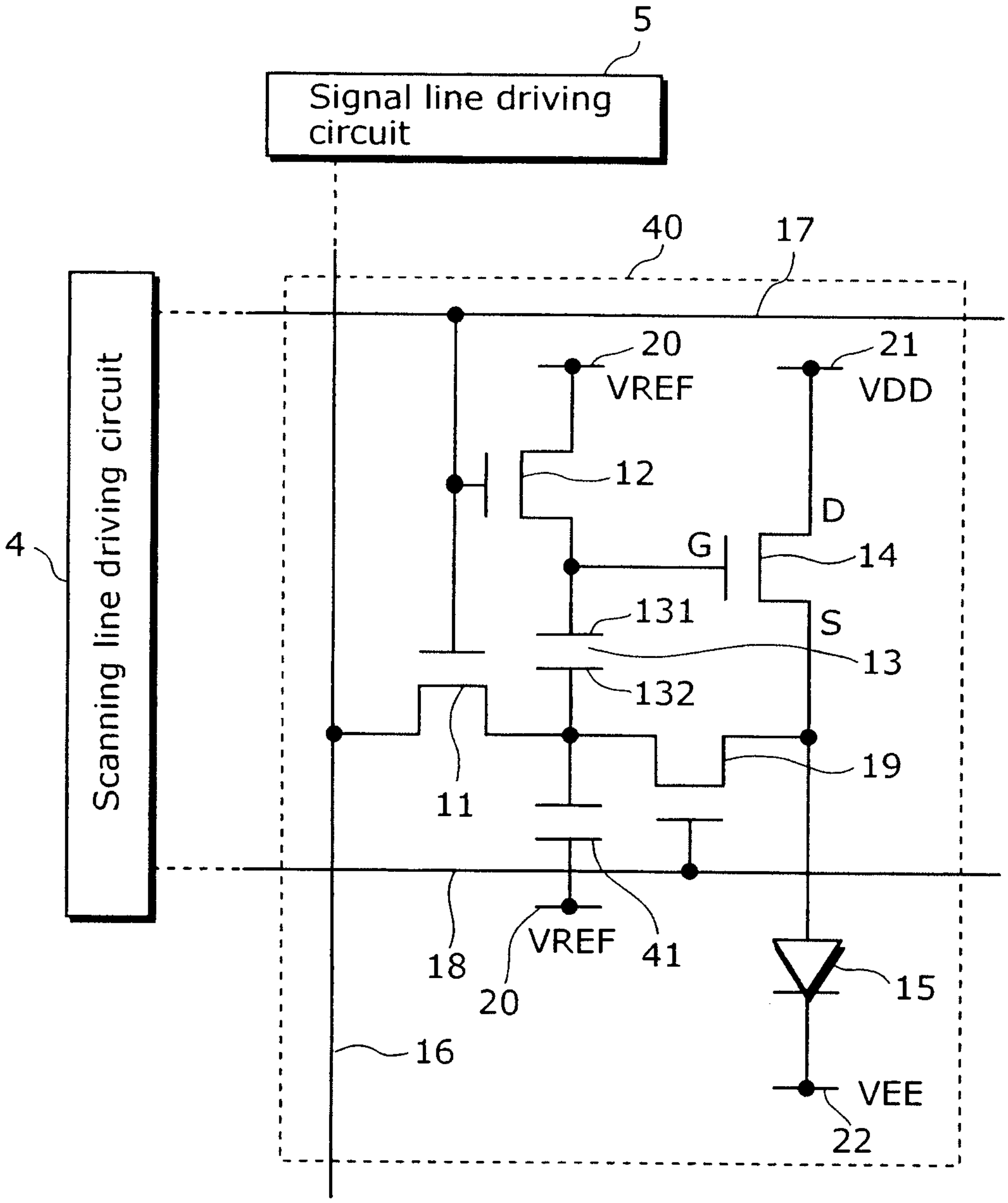

5
Signal line driving circuit
40
17
4
Scanning line driving circuit
20
VREF
21
VDD
12
D
G
14
131
S
13
132
19
11
18
VREF
41
20
15
16
VEE
22

FIG. 9

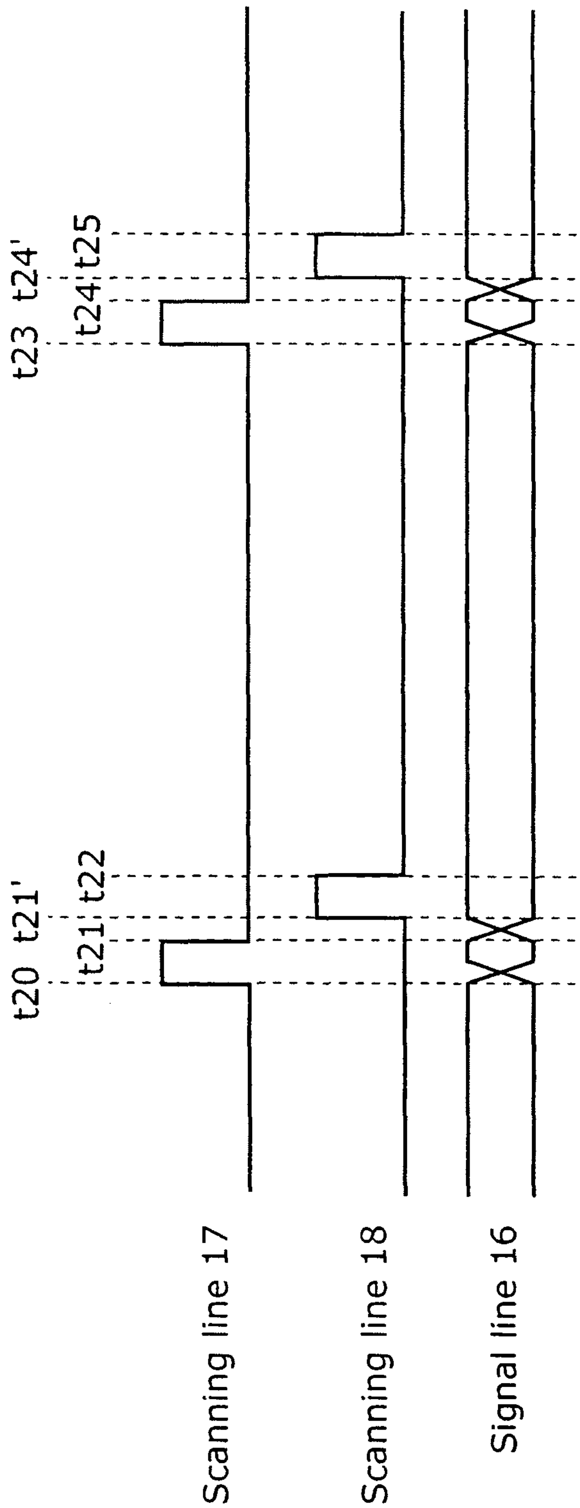

t20
t21'
t21
t22
t23
t24'
t24'
t25
Scanning line 17
Scanning line 18
Signal line 16

FIG. 10

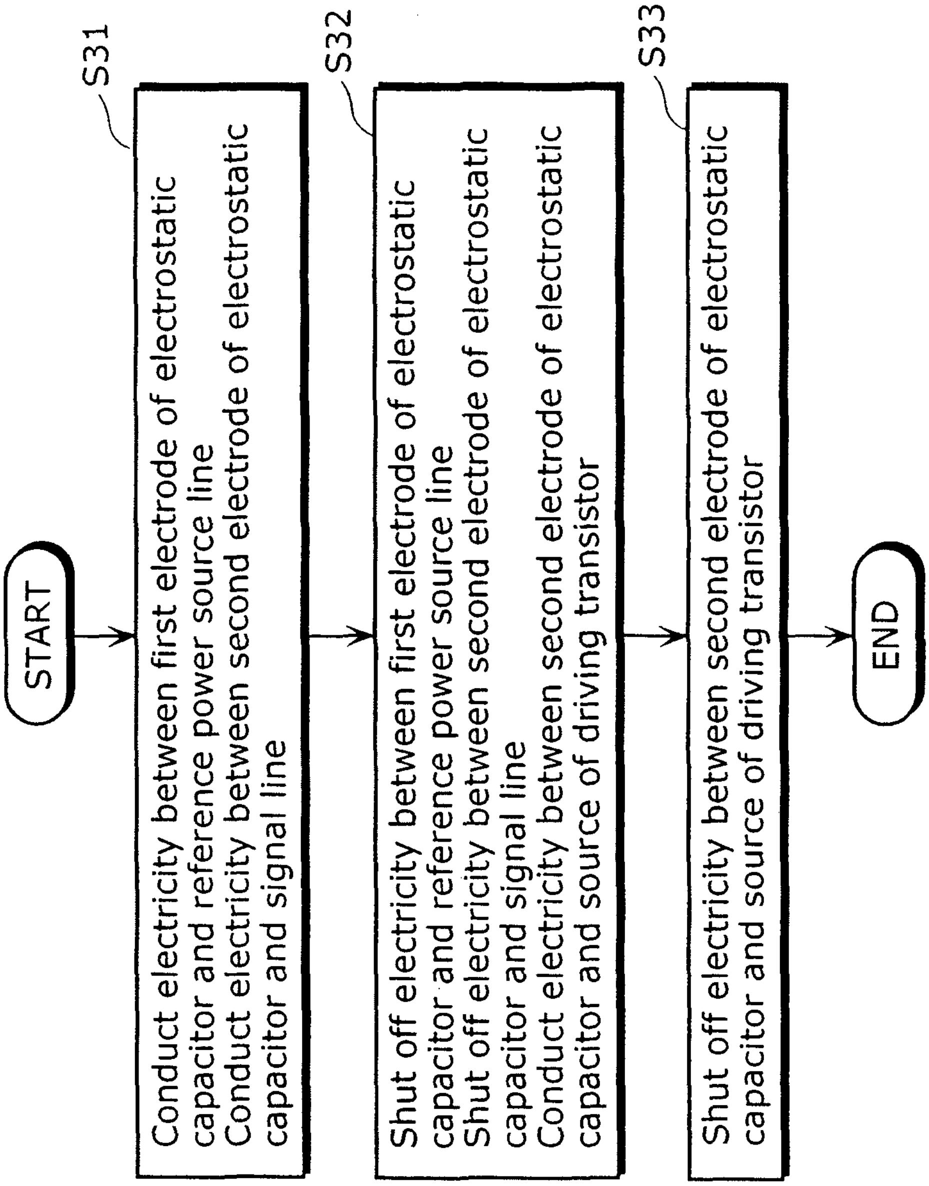
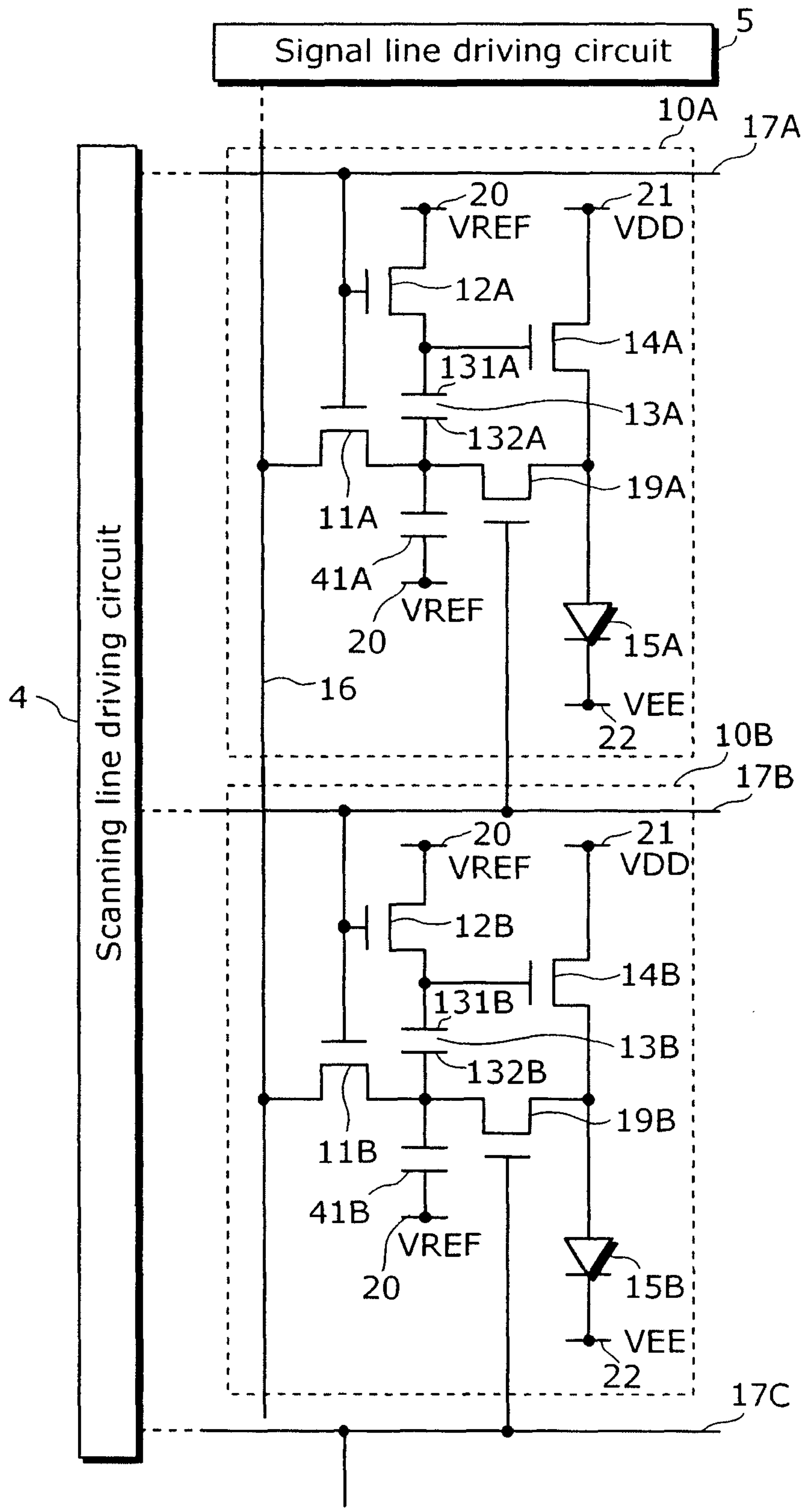

START
S31
Conduct electricity between first electrode of electrostatic capacitor and reference power source line
Conduct electricity between second electrode of electrostatic capacitor and signal line
S32
Shut off electricity between first electrode of electrostatic capacitor and reference power source line
Shut off electricity between second electrode of electrostatic capacitor and signal line
Conduct electricity between second electrode of electrostatic capacitor and source of driving transistor
S33
Shut off electricity between second electrode of electrostatic capacitor and source of driving transistor
END

FIG. 11



Signal line driving circuit
5
Scanning line driving circuit
4
10A
17A
20
VREF
21
VDD
12A
14A
131A
13A
132A
19A
11A
41A
VREF
20
15A
16
VEE
22
10B
17B
20
VREF
21
VDD
12B
14B
131B
13B
132B
19B
11B
41B
VREF
20
15B
VEE
22
17C

FIG. 12

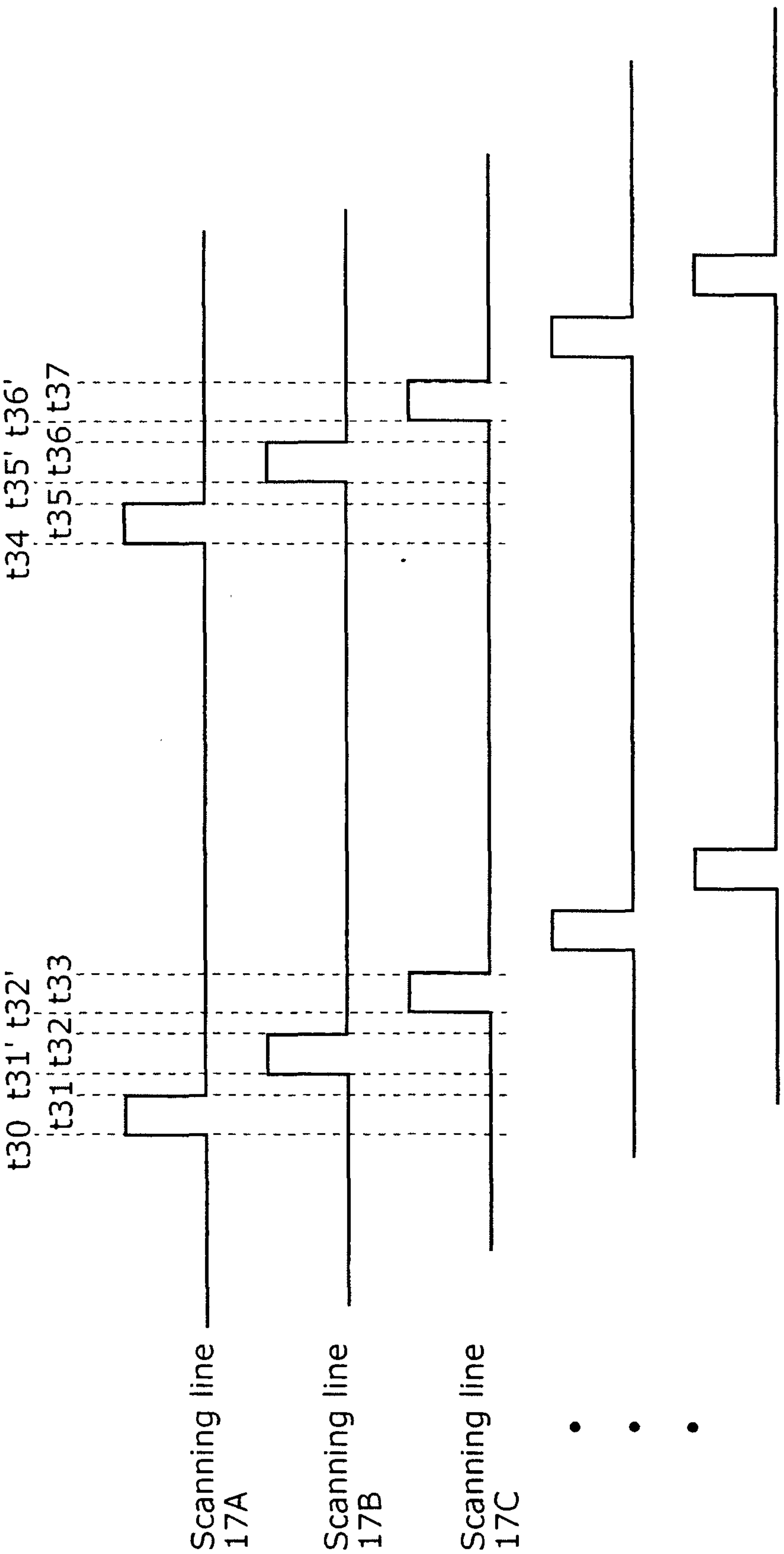

t30 t31' t32'
t31 t32 t33
t34 t35' t36'
t35 t36 t37
Scanning line 17A
Scanning line 17B
Scanning line 17C

FIG. 13

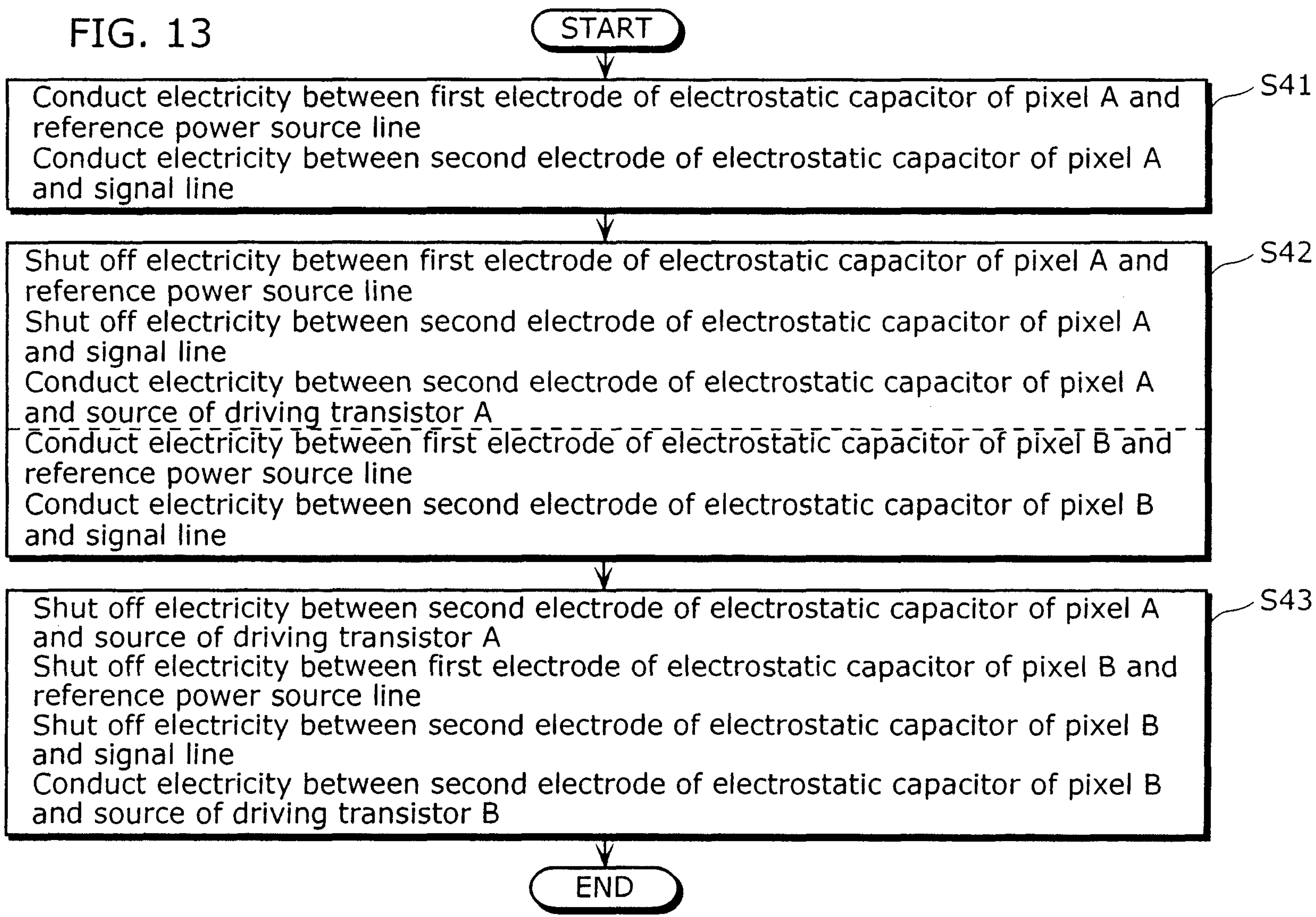

START
Conduct electricity between first electrode of electrostatic capacitor of pixel A and reference power source line
Conduct electricity between second electrode of electrostatic capacitor of pixel A and signal line
S41
Shut off electricity between first electrode of electrostatic capacitor of pixel A and reference power source line
Shut off electricity between second electrode of electrostatic capacitor of pixel A and signal line
Conduct electricity between second electrode of electrostatic capacitor of pixel A and source of driving transistor A
Conduct electricity between first electrode of electrostatic capacitor of pixel B and reference power source line
Conduct electricity between second electrode of electrostatic capacitor of pixel B and signal line
S42
Shut off electricity between second electrode of electrostatic capacitor of pixel A and source of driving transistor A
Shut off electricity between first electrode of electrostatic capacitor of pixel B and reference power source line
Shut off electricity between second electrode of electrostatic capacitor of pixel B and signal line
Conduct electricity between second electrode of electrostatic capacitor of pixel B and source of driving transistor B
S43
END

FIG. 14

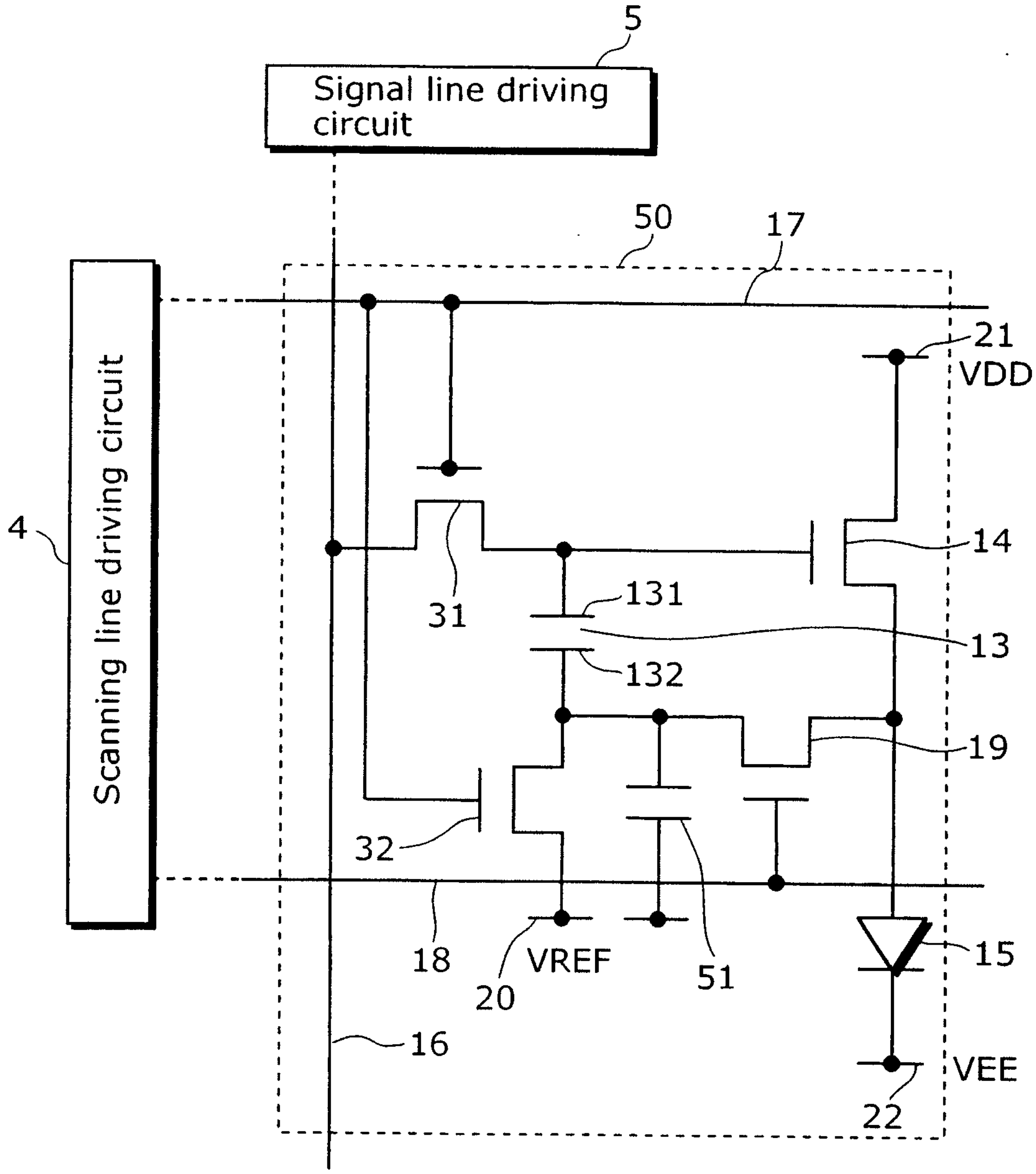

5
Signal line driving circuit
50
17
4
Scanning line driving circuit
21
VDD
14
31
131
13
132
19
32
18
VREF
20
51
15
16
VEE
22

FIG. 15

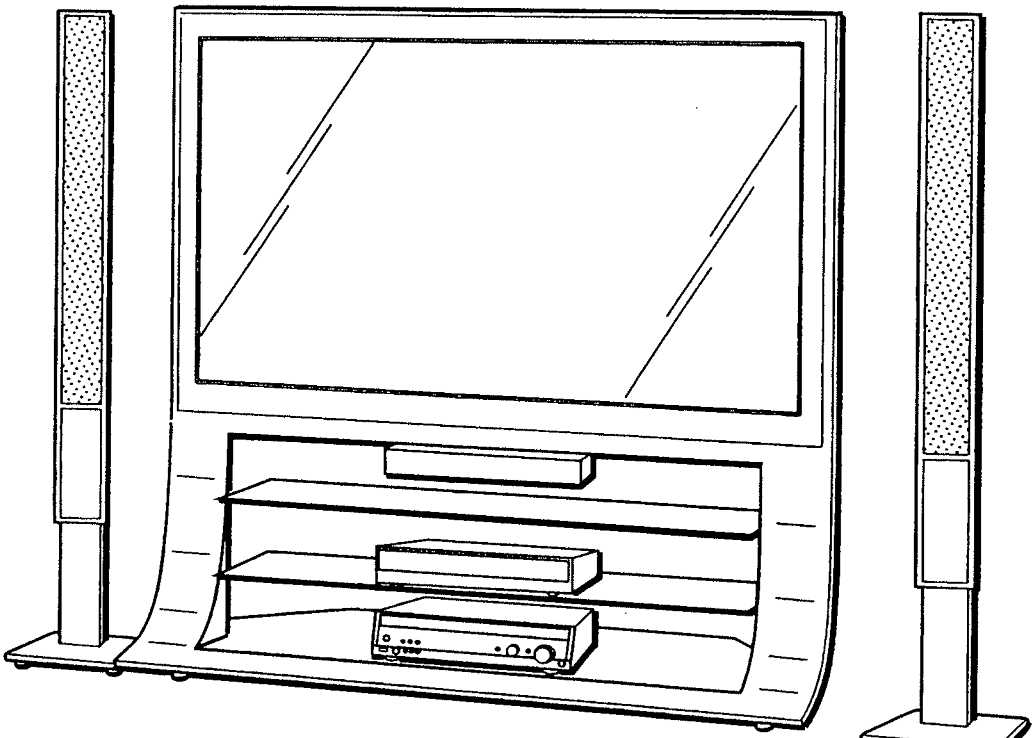
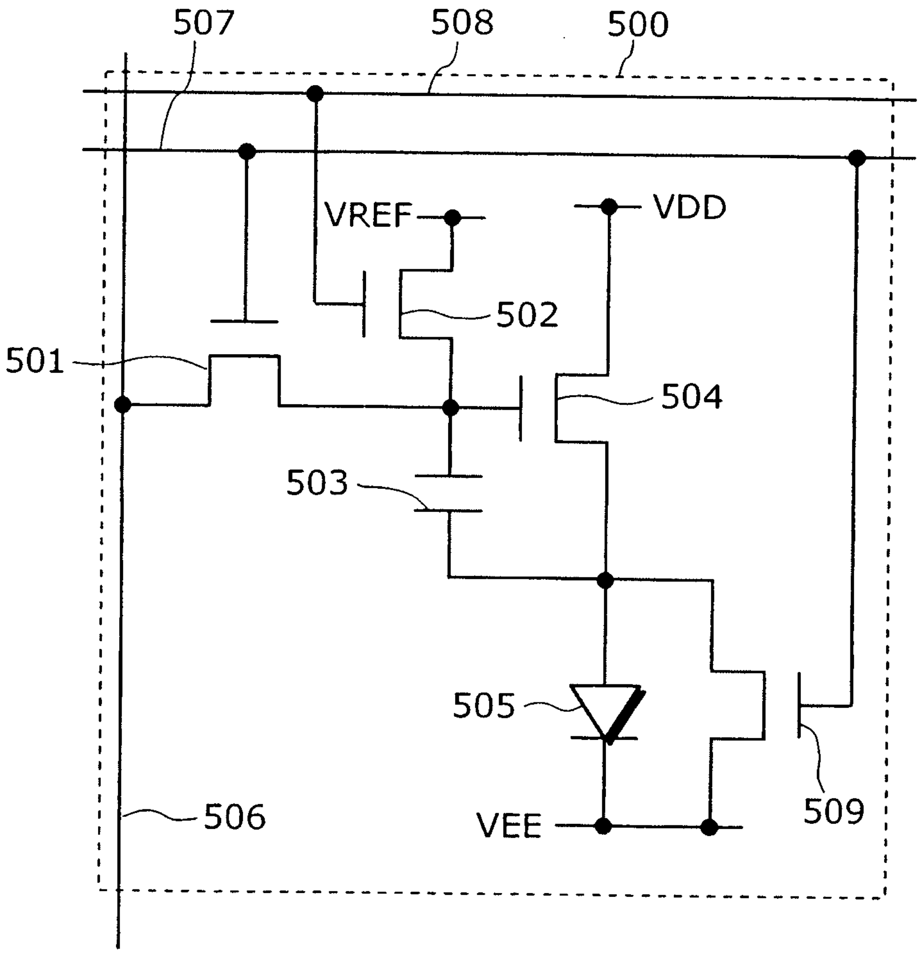


FIG. 16



REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2005004173 A **[0013]**
- US 2003111966 A **[0014]**
- US 2006066251 A **[0015]**
- US 2005243076 A **[0016]**
- US 2006231740 A **[0017]**

专利名称(译)	图像显示装置及其控制方法		
公开(公告)号	EP2226786B1	公开(公告)日	2016-04-13
申请号	EP2009818966	申请日	2009-10-06
[标]申请(专利权)人(译)	松下电器产业株式会社		
申请(专利权)人(译)	松下电器产业株式会社		
当前申请(专利权)人(译)	JOLED INC.		
[标]发明人	ONO SHINYA		
发明人	ONO, SHINYA		
IPC分类号	G09G3/32		
CPC分类号	G09G3/3233 G09G2300/0842 G09G2300/0852 G09G2310/0251 G09G2310/0262		
优先权	2008261029 2008-10-07 JP		
其他公开文献	EP2226786A4 EP2226786A1		
外部链接	Espacenet		

摘要(译)

一种图像显示装置，包括：有机EL元件（15），静电电容器（13），具有连接到电极（131）的栅极的驱动晶体管（14）和连接到有机EL元件的阳极的源极（ 15），设定电极（131）的基准电压的开关晶体管（12），设定电极（132）的信号电压的开关晶体管（11），连接阳极的开关晶体管（19）有机EL元件（15）和电极（132），以及扫描线驱动电路（4），其通过导通开关晶体管（11）使静电电容器（13）保持与信号电压对应的电压。（12）当开关晶体管（19）截止时，随后通过断开开关晶体管（11）和（12）导通开关晶体管（19）。

FIG. 1